Living with Extreme Weather Events: An exploratory study of psychological factors in at-risk communities in the UK and Belize

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Abstract

Questionnaire surveys and semi-structured interviews were conducted in flood risk areas in the UK and hurricane risk areas in Belize, Central America. The research was designed as a cross-hazard, cross-cultural study of psychological factors contributing to responses to the risks of extreme weather events (EWEs) as no other studies comprising all of these elements were found in a review of the literature. The main research themes, based on information gathered from at-risk communities, from experts in the field of Disaster Risk Reduction (DRR) and from applied literature across a number of disciplines involved in DRR were; the role of prior experience, attributions of responsibility of and for self and others, trust, community and place attachment, engagement in preparedness behaviours and decision making style. Based on an identified overlap between EWEs and climate change research, a section on beliefs about climate change and the wider natural environment was included. The research was exploratory to assist in the design of more focused future studies and the application of existing psychological theory to the context of EWEs. Results showed that the themes of prior experience, trust and place attachment emerged the most strongly. Decision-making did not show the expected links with other themes. Gender differences were found particularly in perceptions of risk, as found in previous risk perception research and in reported engagement in preparedness behaviours. This has important implications for the design of risk communication strategies. Engagement in preparedness behaviours, whilst intended to be a central theme was not able to be used as intended, as it was constrained in its value in this study by being a subjective measure. The Belize sample showed more positive attitudes across the study themes, but it is difficult to ascertain if this was a reflection of true differences or of a difference in the way in which surveys are completed. Further research is needed on this theme. Additional country-specific issues were raised by the qualitative study in Belize, such as the importance of development issues and of traditional knowledge in the management of risks. Results offer both useful descriptive information for application to policy and give direction and focus for the development of future studies designed to apply psychological theory to the problems posed by human interaction with natural hazards. Outline suggestions for a number of future studies are provided, centring on further and more detailed exploration of the major emergent themes.

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Chapter One

Introduction and Literature Review

Context

More and more people worldwide are living in areas at risk from the impact of natural hazards. These hazards may take the form of slow onset events such as drought, heat wave, coastal erosion and other such threats brought about through climate variability and changing landscapes. They may also take the form of more rapid onset, high impact hydro-meteorological and geophysical events such as hurricanes, tornadoes, earthquakes, volcanoes, flooding, fires, tsunamis and landslides. The reasons for the increased incidence of such hazards are many, including increasing climatic instability and socio-economic factors leading to population migration into areas less suitable for human habitation.

When a natural hazard becomes a disaster, the losses (both human and economic) are often catastrophic and therefore attract attention worldwide (e.g. the Asian Tsunami in December 2004). Relief operations are usually swift and intensive, but relatively short term as both the public interest and the funding soon wanes. It has long been recognised that an event such as any of those listed above does not automatically become a disaster however, as there are multiple additional factors at play before and during the event that can mitigate or dramatically increase the losses that follow. The issues to be addressed are monumental in scope and include political, economic and social factors on a global scale.

Professionals working in disaster management have for some time been calling for more attention to the issues in mitigation and preparedness, and a move away from historically reactive approaches when a disaster has already occurred. This clearly requires multi-disciplinary, international collaboration. Most of this work has so far been initiated by the physical sciences in terms of

increased efficiency in prediction of events that may lead to disaster. Disaster management professionals have also been working with Non-Governmental Organisations (NGOs) and policy makers to improve communication of risk and preparatory measures in order to help communities to protect themselves more effectively. Much of the emphasis has however been concentrated on assessment of the vulnerability of communities living in hazardous areas, based on a range of socio-economic and cultural factors but with very little input from the communities themselves. Much of the evidence of coping strategies for living with uncertainty in the context of natural hazards takes the form of anecdotal evidence from disaster management professionals working in the field. There have also been studies conducted across a range of disciplines such as anthropology, sociology, geography and disaster management, covering themes including group level practices and influences that affect the way in which people respond to risk. See for example Drabek (1986). Most of these studies concentrate primarily on how the context in which people live serves to contribute to their vulnerability or resilience in dealing with the risks of extreme weather events and an overview of some of this work will be provided later in this chapter. The area that has so far mostly been neglected is the focus of the current research is the role of behaviours, beliefs and individual differences in how people across different hazard and cultural contexts respond to the risks associated with events in the natural environment.

First, an exploration of the evidence of the importance of social science work in general is provided, using real life examples of behavioural and attitudinal responses to the threats and then an overview of some of the literature from disaster risk reduction (DRR) that reinforces these gaps. Finally an exploration of the role of psychology in helping to fill some of the gaps that have been identified, firstly through a review of the contribution of applied social psychology to date and then through an examination of the themes and methodology to be employed in the current study, is presented.

Physical scientists around the world are working hard to understand better the behaviour of the natural hazards that pose the greatest risk to humans and their assets. The assumption has often tended to be, however, that if an event can be accurately predicted, the risk can be communicated to people in a timely manner and that people have adequate resources at their disposal to respond and keep themselves safe, then that is what they will do. Whilst in some cases this is indeed so, it has been observed time and time again not to be the case. Yet often, the conclusion drawn is that if people do not react in the way considered the safest by scientists and decision makers then they cannot have really understood the risk. This could be part of the explanation in some cases, but it is becoming more and more apparent as events are occurring around the world that the link between hazard prediction and human response is a complex one and as yet not at all well understood.

Before looking at some of the literature that reinforces this gap in understanding, some examples of how people have reacted to a known risk before events that have occurred in the past few years illustrate very well how dangerous it is to assume that the relationship between understanding that a risk is present and taking the 'safest' course of action is a direct one. The author has spent time in countries that were affected by natural disasters, both during the course of this project and before, and has been able to compile a number of stories from people who have been willing to share their observations and experiences.

In Thailand on Boxing Day 2004, local people in the island of Koh Lanta in the south west of the country observed the tide recede very rapidly. As a predominantly fishing community, the people knew that this was a sign of a possible tsunami and that the safest thing to do would be to move as fast as possible to higher ground. Most people did, but a number of fishermen did not and in many cases it cost them their lives. Instead, they went out across the sand to retrieve their fishing boats knowing, apparently, that they were putting themselves at great risk. Obviously those who did not make it back were unable to offer an explanation for their behaviour, but those for whom the gamble paid

off were happy to explain. They said that whilst they were fully aware of the risk they were taking, the boats that were still moored out on the wet sand were their only ticket to a continuing income and therefore their only means to support their families. If they were to run to high ground and leave the boats, then once the immediate impact of the tsunami had passed, their livelihoods would be ruined and they did not have the money to replace the boats. So for them, the risk of running out to retrieve the boats was calculated to be a worthwhile one when pitted against the certain loss of their livelihood if they did not go. In some cases this gamble paid off, in others it did not. To the outside world, the choice between heading for the hills or heading out towards an incoming tidal wave seemed such an obvious one as not to be worthy of consideration. In addition, there were others in the community who lived lives of great poverty and were constantly searching for sources of food and income. For them, the sudden retreat of the tide offered a temporary 'gold mine' of stranded fish and another kind of gamble was made. In some cases, people were able to collect an impressive catch that they could use both to feed their families and to sell on. In others, the gamble again cost them their lives.

On the Gulf Coast of Texas during the hurricane season of 2008, people were warned about an incoming hurricane named Gustav and many evacuated inland before it was due to make landfall. As it turned out, Gustav veered off to the east at the last moment and the section that had been at the highest risk was ultimately never touched by it. Only a few weeks later, the same section of the coast was warned about a second hurricane that was tracking their way, this time named Ike. Some people evacuated a second time but many did not. Some of those who did not said that it was for economic reasons because they were not covered by their insurance if a hurricane did not actually hit their home, as was the case with Gustav, and that they could simply not afford to evacuate twice in quick succession. Others said that they did not trust that the authorities were giving them accurate information about the risk posed by Ike. They believed that in order to try to force people to evacuate, the authorities had exaggerated the risk and in an attempt to change behaviour through fear. So they chose not to leave as they did not believe that Ike would cause the damage predicted. Some said that they simply could not face another evacuation so soon and would rather take their chances, some said that they

had weathered a hurricane before and did not feel the need to evacuate and some said that they felt it was simply a risk they had to deal with if they wanted to live in a location like this. Others said that they wanted to experience a hurricane first hand and stayed specifically to witness some of what nature could do. Some of those who did evacuate said that for them, there was never any question; if a warning was issued they would be gone until it was safe to return, whatever the costs. Other reasons given for a reluctance to evacuate every time there was a warning issued, despite the acknowledgement of the danger this could present to their personal safety, included income loss, welfare of pets, protection of property and a wish to make own decisions. In one case, a man living on a trailer park in southern Louisiana stated a great pride in his community's perceived resilience in the face of hurricane risk and he explained this by saying that he and his family had lived with the risk all their lives, experienced several hurricanes but never evacuated and had always ultimately come out of the event unscathed. He felt that to evacuate was a sign of defeat and his defiance a badge of great honour.

In a different context, but nevertheless one where people are faced en masse with threats to their personal safety from an external source outside of their sphere of control, some more interesting reactions to the risk were reported. During the siege of Sarajevo in the Bosnian war and in the 1999 NATO bombing of Belgrade in relation to the Kosovo conflict, many people after an initial period of extreme fear found themselves having a strong counter reaction and holding 'bombing parties' as a visible defiance to the planes flying overhead. People said that it gave them a sense of solidarity and pride against an external threat and restored some of their sense of control. This was a phenomenon also reported in hurricane risk areas in Texas where some people held 'hurricane parties' in defiance of the 'wrath of nature'.

In 'tornado alley' in the USA, a number of people were asked what the first thing is that they do when a tornado warning sounds. Many said that they take shelter immediately, but an alarming number said that they would go outside to see. When asked why, most could not give a definitive reason but instead said things like 'I just need to see it before I decide what to do'.

Also in 'tornado alley', two women who had moved to the plains from different US states gave very similar stories about how they felt about tornado risk. One had come from San Francisco to Colorado and had experienced a major earthquake as a child, in which people were killed and her house was badly damaged. She had never experienced nor seen a tornado since moving to Colorado. Another had moved from Boston to Kansas and had, as a child, experienced a hurricane. Since living in Kansas she had not had any firsthand experience of a tornado either. Both said that they were very afraid of tornadoes and would far rather be living with the risk of the events of which they had personal experience rather than the unknown. By contrast, most people who had been living in tornado risk areas all of their lives or at least for many years said that whilst they were aware of the dangers posed by tornadoes, they did not feel especially frightened of them and viewed them as an inevitable part of life in this region of the country.

These examples cover a wide range of responses to risks posed by events outside of people's control. In some cases their choices could be attributed almost entirely to context, for example in the case of the Thai fishermen choosing to take a risk in order to avert an almost certain loss of livelihood, or in Texas where the costs of multiple evacuation were simply greater than the money available. Other examples highlight the complexity of human decision making in the face of risk even when from an objective perspective the choice to be safe seems both obvious and available. This may include the pride in staying together as a community in a trailer park, rather than to evacuate, despite the huge physical danger of being in such fragile structures when a hurricane occurs, or the choice to hold parties outdoors as a hurricane approaches in an act of deliberate defiance.

At an international level, the questions posed by the range of behaviours such as those described above are being addressed and discussed. The International Council for Scientists' Union (ICSU) have formed a planning group for international multi-disciplinary research on disaster risk reduction. A draft document was produced by this planning group in 2008 and provides a useful overview of the themes emerging for investigation at an international level.

The report provides up-to-date theoretical and 'needs-based' framework for current studies in relation to disaster risk reduction and is multi-disciplinary and collaborative in scope. The report draws attention to the fact that most disaster losses come from climate related events (sudden and slow onset) rather than geo-physical and highlights the need for better integration of research into natural disasters and climate change. It also highlights the need for integrated research across the physical and social sciences, as well as across academic/policy maker boundaries and points in particular to the need for closer cooperation of natural, socio-economic, health and engineering sciences; "There is a great shortfall in current research on how science is used to shape social and political decision-making in the context of hazards and disasters" (p.5).

It points out that whilst developing countries do often bear the brunt of large events, DRR is not just about economic development and growth and that in actual fact losses are increasing in the developed- as well as the developing world.

The second main objective in the report highlights the need for a better understanding of the human side of DRR: "...understanding decision-making in complex and changing risk contexts" (p. 6). Whilst the wording here focuses on decision making, there is a recognition of the many factors that may contribute to how people arrive at such decisions and this is a key area for development. This is clearly the role of the social sciences and it is important that new research is developed in collaboration with other academic disciplines as well as disaster management professionals in order both to ask the right questions and to develop projects that inform all those involved in attempting to reduce losses incurred by natural disasters.

Throughout the report, there is an emphasis on using science to help prevent hazards from becoming disasters, both in terms of better predictions of the events themselves and a better understanding of human interactions with the natural environment. Also suggested is the need to move away from the

assumption that losses will inevitably increase in the future because of population growth and economic development and encourages the focus to stay with finding areas in which losses may realistically be reduced despite the inevitable growth and migration. Such an area would be to understand better the ways in which human behaviour can increase the negative impacts of an event even when prediction is effective and mitigation strategies are in place.

Also of direct relevance to this research is the suggestion of the need for greater engagement with populations living in hazardous areas in order to gain better understanding of social and cultural factors and adds that "The overall goal of contributing to a reduction in the impact of hazards on humanity would require some relatively non-traditional research approaches." (p.8).

As further reinforcement of the need for the type of research being undertaken in this thesis, the report also provides a range of statistics on the global impact of disasters:

- The frequency of recorded disasters has risen from 100 per decade from 1900-1940 to almost 2800 per decade in the 1990s.
- Property damage has been doubling about every 7 years over the past 40 years.
  (It is however important to recognise that some of the increase in these figures can be attributed to better reporting mechanisms and registering of small and medium events).

- In the 1990s, around three-quarters of all natural disasters were triggered by meteorological events.
- Global economic losses from natural disasters have totalled an estimated US$75m in 2007, US$50m in 2006, US$220m in 2005 and US$150**bn** in 2004. The majority of these losses were uninsured.

Another important consideration is the rapidly changing context of natural disasters. Urban infrastructures pose very different threats than rural environments and therefore dramatically change the context in which people are making decisions and also changes the types of risks to which people are

exposed for the same type of event. Alongside the different contexts in which risks are presented, attention is also drawn to human activities (aside from population movement) such as changes in land use. For example farming practices in the Mayan mountains in Belize led to flash floods and landslides during the 2008 wet season. Other examples include the destruction of mangroves increasing exposure of coastal areas to storm damage (tidal surges etc.) and increasing emissions leading to more frequent weather events (one of the main climate change/natural disaster links). This also increases the risk of other climate triggered events such as heat waves and wildfires.

The report makes direct links between natural disasters and climate change, described as a result of the effect of globalisation on the geophysical environment and the altering of natural hazard risks as a consequence. Statistics from the International Panel for Climate Change (IPCC) (2007) are quoted and include the linear warming trend over the last 50 years, which has increased to nearly twice that for the last 100 years (now 0.13 degrees C) and projected to reach about 0.2 per decade for the next two decades. Hurricanes are predicted to become more intense (larger peak wind speeds and both more frequent and heavier precipitation) with increasing surface temperatures of tropical seas and extra-tropical storm tracks are predicted to extend pole-wards.

The main relevant points of the ICSU plan from a scientific perspective include the need for integrated approach "...across hazards, disciplines and scales" (p.15). Also, "As noted by the predecessor ICSU scoping group..., there is a great shortfall in current research activities on how science is used to shape social and political decision-making in the context of hazards and disasters". (p.16).

As mentioned earlier, the second of three objectives in the proposed research programme is: "Understanding decision-making in complex and changing risk contexts". More specifically; "Public perception-decision making in the context of natural hazards, risk and uncertainty would be an important research area, as would the study of human behaviour in cultural contexts for vulnerability analysis" (p.22). Particular emphasis is placed on the political, institutional, cultural and economic aspects of decision-making and behaviour as important areas for exploration.

Decision making is a key aspect of the proposal and suggestions include the need to address the concept of 'rational' decision-making. For example, decisions made by those living at risk may 'objectively', according to experts, increase the risk of causing a hazard to become a disaster and yet for those making the decisions, they will at least at some level most likely have appeared to them to be rational. There can be, it would appear, a large mismatch between the definition of a rational decision by those viewing the situation externally and those who are living in it. Also, decision-making needs to be examined at the level of individuals in the communities at risk rather than exclusively those identified as decision-makers in policy making, risk communication and disaster mitigation and response. This plan refers to decision-makers at all levels but it is an important distinction between those in policy making and management positions and those living with the risks. As a concept, 'decision making' has been studied extensively by a number of different disciplines and as a result there is a vast literature including a range of different definitions. The question of how best to address the process of decision making within at-risk communities will be returned to later after an introduction to the role of psychology in addressing some of the research needs emerging across the DRR community.

A further sub-objective refers to "decision-makers and various publics" (p.23) in terms of the importance of understanding the contribution of risk perception to subsequent actions. In other words, "Understanding is needed on the role of cognitive appraisals and emotional reactions as motivators of behaviour." (p.23). Also, "Public perceptions of risk (where these diverge from expert views) need to be understood from the perspective of people's personal experience of the hazard and their understanding or beliefs about the processes that can increase or decrease the likelihood of the hazard turning into a disaster." (p.23). Risk perception and the role of prior experience will also be examined in more detail within the context of the specific role of psychology in DRR research.

It is further noted that for poor communities, every day issues will most likely take priority over managing or preparing for the risk of low-probability, albeit high impact, hazards. For example, ensuring that children are able to receive a formal education, securing property from theft or harm and keeping a

steady income are all likely to feature more highly on a day to day basis than the risk of an event that often cannot be predicted with any level of certainty. Also, moving away from a hazardous area is less likely if income or security will be compromised as a result, even if physical safety of self and family is increased in relation to the natural hazard. In other words, threats posed by the natural hazard are most likely being appraised in relation to a host of other real and perceived threats rather than in isolation. These are some of the contextual differences that may be found between the 'developed' and 'developing' world and in order to gain a more in depth understanding of human behaviour in differing context it is also important to consider cultural differences. This would need to include recognition not only of what the differences between cultures are and how they may impact on responses to natural hazards, but also the similarities. In other words, which findings may be expected to be the same across different contexts and cultures and therefore may be attributed to more general aspects of the human condition.

Further factors that have been observed to impact on decision making include the appraisal of long term versus short term consequences. "In several fields of decision-making, immediate consequences have been found to have more impact than prospects of (even large) costs or benefits over the longer term." (p.23).

It is also pointed out that many different kinds of values can impinge on people's choices regarding the avoidance or tolerance of risk. "Attachment to place is frequently a highly charged aspect of people's personal and cultural identity, and not likely to be set aside just because somewhere else may be rather safer." (p.24). Again, place attachment can mean different things according to different disciplines and even different researchers within the same discipline and this will be examined in more detail in the review of psychology literature.

A further important point is made about the limitations of the value of understanding risk perception in communities where actual control over behaviour is tightly constrained by external factors such as income or political factors. "Nonetheless, many at-risk communities still attempt to regulate their hazard exposure even within the limited range of options available to them, and

research should examine what belief systems and practical experience are guiding their decisions, and how effective their actions are, with the aim of establishing where and how can interventions be made if required." (p.24). A theme such as this will inevitably require an examination of a number of factors such as decision making, prior experience, attitudes and beliefs relating to the hazard and its management, which in turn will be affected by cultural belief systems including religion.

A later objective refers to the British Psychological Society (BPS) working party on disaster, crises and traumas, "recognizing that the role of psychology is not only to assist in managing the psychological impact of disasters but also to play a key part in understanding how people behave (or do not behave) in the events leading up to a disaster; and engaging at planning at all stages." (p.38). This point will be returned to later when the specific role of psychology in DRR is introduced.

The plan also acknowledges that previous research has indeed been conducted into decision-making processes and the theme of risk and disaster, but that "this has neither been systematic or sufficient in itself." (p.44).

So in summary, the report calls for an international multi-disciplinary approach to disaster risk reduction that includes a much more systematic and thorough look at the factors that influence the way in which people make decisions and choose behaviours in the context of the threats posed by natural hazards. Particular attention is drawn to the need for a better understanding of the impact of both individual and cultural differences on how people respond as well as the more traditional approach of studying the impact of the physical context alone. This will require research from across the social sciences in order to capitalise on the strengths and compensate for the limitations of each individual discipline. For example, a study in human geography designed to examine the differences between urban and rural populations in response to the risk of a given hazard at the group level being conducted alongside a psychology study designed to focus on the individual differences in risk perception across both populations. Both the methodologies and the specific research questions may be quite difference, but the findings would provide different pieces of the same 'jigsaw'.

In support of the real life examples presented earlier and the themes outlined by the ICSU planning group, there is also a rapidly growing body of literature calling for more attention to be paid to the gaps in understanding people's behaviour in relation to natural hazards. The scope of this literature is vast and covers a number of academic and applied disciplines including disaster management, sociology, anthropology, economics and human geography. Clearly a systematic review of this literature would have been neither practical nor especially useful for the current project. Consultations were instead held with a number of professionals working in disaster risk reduction in order to gain further understanding of the most prominent gaps in research to date, to generate discussion on a number of potential research themes and to gain advice on the most relevant literature to address these themes.

Meetings with experts in the disaster management field

Dr Lynette Rentoul is a Clinical Psychologist who at the time of meeting was working in trauma and crisis research and the development of response strategies in the UK. Her work was predominantly with children and focused on hazards such as disease pandemics and industrial accidents that may impact on civilians, but over her career she has gained a wealth of experience and knowledge around how people react in a crisis. She offered a very helpful discussion confirming the need for more research into how people cope with uncertainty and risk across different cultures and socio-economic groups, and how people use prior learning and experience in future decisions relating to the same risk.

A visit to the Flood Hazard Research Centre at Middlesex University was undertaken in order to meet with several researchers involved in both physical and social science research into flood hazards, mainly in the UK. This visit provided useful information about the impact of attributions of responsibility in how people react to both the threat of an event and the event itself. Researchers here also confirmed that cultural factors play a distinct role in how people react. They also confirmed the need to find out more about how people

prioritise in the face of a multi-hazard environment, rather than the more common focus on a single hazard type, especially those in developing countries with poverty to contend with alongside the threats posed by the natural environment. Part of the discussion also focused on the use of denial as a defence strategy against prolonged stress whilst living with risks on a day to day basis and the danger that this coping mechanism can pose when more proactive responses are required in order to stay safe. A question posed here as one of the most important for future research was how people can be encouraged to move beyond it and respond proactively to the threat, by identifying what may motivate a change to proactive behaviour in this context.

Jane Gilbert, a freelance consultant with a breadth of experience in working with NGOs in responding to trauma and crisis, drew attention to the need for awareness of the impact of cultural differences in the way that people respond to natural hazards. She has worked in Africa (Lesotho) on community development issues and introduced Maslow's 'hierarchy of needs' to the groups with whom she worked. She was struck by how different their self concept was when it came to discussing self-actualisation, as they have a tendency to be far more relational in their priorities rather than individual and therefore had great difficulty with a concept that required them to perceive themselves as an entity independent from others in their family and community. This highlighted the importance of understanding a person's self-concept in relation to others when building a picture of how they may respond to their environment and make decisions, especially in a context where a potential threat is on a community scale rather than individual or family. So, in relation to the current project the discussion focused on the importance of understanding choice and behaviour in the context of both self-concept and cultural beliefs.

Dr. John Twigg is based at Benfield Hazard Research Centre (BHRC), University College London. Originally a cultural historian, he now works in disaster management research as well as teaching on disaster management degrees at the centre. He has an in depth knowledge of the literature relating to fieldwork in disaster management in the developing world. Here, the discussion centred on how people adapt to a risk over time and what makes people engage in adjustment behaviour and of what kind, both of which are not yet well understood. Observations suggest that people do mostly engage in some kind

of behaviour in response to a change in risk, but the behaviours are not always healthy or helpful. He agreed that understanding how people's concept of self may affect their decisions and behaviour may be very valuable and also emphasised need for longitudinal work as to how people adapt to risk. Most research to date has been conducted at single moments in time and therefore does not fulfil the need to understand how processes evolve over time, including the role of prior learning and experience of the same threat. Also important is the impact of learning passed through other generations rather than from outside authorities, for example, indigenous knowledge for warning systems (wild animal behaviour etc). Questions such as how indigenous/traditional knowledge and technological information fit together in a hazard context are also in much need of further investigation. Dr Twigg also suggested useful literature on hazards, risks and uncertainty that he believed would be the most relevant to the themes we discussed. These papers are outlined below, followed by a selection of others from across the field of disaster risk reduction. Following a review of the literature from other disciplines, the role of psychology in addressing some of the gaps identified here will be introduced and a review of the relevant literature from within psychology will be presented last.

Literature Review

So, the development of concrete ideas for the studies that will be presented here came from a combination of the conversations with people living in high risk areas, from advice from and discussion with professionals in the field of DRR and from gaps that were identified in the disaster management literature in relation the social factors in the context of mitigation and preparedness. The latter source will be outlined here as further reinforcement of the ideas presented so far, followed by a review of the small number of applied social psychology studies that have been carried out in the context of extreme weather events and a selected number from geophysical hazards. The way in which the themes to be examined in this study may be explored using a theoretical framework using psychological theory will then be discussed.

General DRR Literature

As a follow up from the meeting at BHRC, a review of the papers produced by researchers there revealed an increasing amount of attention directed towards the need to gain a better understanding as to how people's beliefs, perceptions an behaviours contribute to their vulnerability to natural hazards alongside the threats posed by the hazards themselves. For example, "To understand what makes people vulnerable, we have to move away from the hazard itself to look at a much wider, and a much more diverse, set of influences: the whole range of economic, social, cultural, institutional and even psychological factors that shape people's lives and create the environment that they live in." (Twigg 2001, p.2). In another paper the concept of vulnerability is addressed in terms of what it consists of and what elements it may have that have not been traditionally considered (Heijmans, 2001). It suggests, based on observations, that people "...do not only take into account the possible exposure to danger and future damages (i.e. what outsiders generally refer to as 'vulnerability'), but also their capacities, options and alternatives, and the implications of their decisions. It is important that outsiders understand both sides that make up local people's perception of risk, rather than analyzing and measuring their vulnerability with outside criteria. Outsiders might label two households, who live in similar conditions, equally vulnerable. But the two households might still perceive risk differently and, as a consequence, prefer different risk reduction measures." (p.6). Such suggestions are increasingly being made following years of assumptions that people in the same context with the same factors impacting upon them will behave in broadly the same way. Time and time again this has been observed not to be the case, but the reasons have still not been examined in any systematic and thorough way.

Heijmans (2001) also draws attention to the ambiguity and confusion that exists in relation to the word 'risk' and urges a consideration of the importance of subjective risk as assessed by those living in it as well as 'objective' risk as assessed by scientists and decision makers: "For a long time there was a strongly defended belief by scientists, and also disaster managers, that there

was such a thing as 'objective' risk. It was just a matter of convincing and warning the public of the scientific objective risk 'reality'." (p.6). It is pointed out that scientists measure risk according to statistics and probabilities and often view individuals' behavioural decisions as irrational, whilst sociologists suggest that such behaviours may in actual fact be the product of "individual judgements under uncertainty." (p.6). In addition, it is pointed out that people's perception of the risk may be influenced not only by the hazard but by experience they have had with authorities and decision makers and the way that they have managed the risk. In other words, that trust in authorities may have a significant contribution towards the way people behave to future threats.

This paper also provides case studies of how past experiences with a hazard, the warnings they received and the ways in which they prepared and coped, influenced the risk perception of community members in culturally diverse locations: A flood prone area in Canada and volcanic slopes in the Philippines. In Canada, "the provincial government used exaggeration and intimidation to encourage the evacuation, like arguing that a four-to-six foot 'wall' of water was approaching the communities along the Red River." Locals had previous experience and knew that this was not how this type of flood would progress.

Howell (2003) studied indigenous warnings systems in Coastal Bangladesh and observed that traditional warning systems were not being passed to younger generations and increasingly being seen as non-scientific. Alongside this finding it was also noted that preparedness is very patchy despite many aid efforts and suggested a need to understand better and to incorporate indigenous knowledge into disaster mitigation plans.

In the Philippines, farmers on the slopes of Mount Mayon "only move if they actually see smoke, ash falling, lava flowing and stones coming down the slopes, i.e. when the highest alert level is reached." In fact, "more people die in evacuation centres because of poor conditions, than due to the immediate effects of the eruption. So, the benefits of each day's work on the farm near a 'trembling' volcano are perceived as less risky than the physical exposure to the actual eruption, and 'being safe' but hungry in the evacuation centers." (p.7).

As well as differences in risk perception between local communities and outside authorities, risks are often also viewed differently among people from the same community. Some find certain events or situations unacceptably risky and will do whatever they can to avoid them, while to others the same event may offer opportunities or is simply something that can be ignored.

In a book entitled "The Environment as Hazard" (Burton et al., 1993), the question of what makes a potential event into a hazard is explored. The answer given is that an event only becomes a hazard through human interaction with the potential event, rather than simply the existence of the event in itself. The book draws attention again to the different types of hazard, for example onset time, temporal spacing (i.e. Seasonal as for a hurricane or tornado, or all year round such as volcanoes and earthquakes), frequency, duration and spatial extent. All will make a difference in considering how to respond to the risk.

The book also states that "There has so far been relatively little attempt to develop policies for managing natural hazards as a set of like phenomena" (p.44), suggesting the need for social science research to conduct research in a cross-hazard and/or multi-hazard environment in order to examine which phenomenon may be unique to a particular hazard type and which may be expected to occur regardless of the exact nature of the hazard event. This gap may have been be due to the fact that research relating to the hazards themselves are separated into different fields; meteorologists, seismologists, volcanologists etc. which in turn has meant that social science research has been generated from within these specialities, rather than across hazards. Whatever the reason, very little has been done in a multi-hazard environment and this is an important deficit to address. This also does not necessarily refer only to multiple natural hazards (such as floods, heat-waves, windstorms), but the acknowledgement that decisions are made, particularly in the developing world, in the context of many other high consequence factors brought about by political and socio-economic realities, as mentioned earlier.

Attention is also drawn to subtle distinctions such as the difference between adapting (to a threat over time) and adjusting (which is generally understood to be more immediate and behavioural). There are also distinctions to be made between mitigation and preparedness, and between these two and

reacting as a threat becomes imminent (for example, being aware of and practiced in drills required when tornado warnings sound, compared with how an individual actually reacts when the sirens go off). This outlines one of the research difficulties in gathering subjective reports of how individuals respond to threat as they may be biased by social desirability, or by how they would like to believe they will react. These are different considerations than asking about preparedness and mitigation intentions and behaviours, which are usually carried out well clear of the event actually occurring.

The book also refers back to an earlier work by White (1974), who has been a prominent figure in the field. Residents in hazard zones were asked about what could be done about natural hazards and replies generally referred to a limited range of actions by individuals, communities and governments and also points out that "They vary greatly in number according to cultural setting and type of hazard" (p.52).

The book proposes a model called the 'Choice Tree of Adjustment', which proposes that "Once located and committed to a particular resource use, people use a variety of psychological, personal and social devices to (1) discount losses by disregarding them or including them with other costs of location, or to (2) accept losses or to distribute and share them with other people" (p.57-8). So, people do one of three things. They either firstly accept losses, which may take the form of bearing the impact and sharing the burden, or they reduce losses, which goes along with the acceptance that preventing the events altogether is impossible and involves designing human activities to prevent harmful effects. This may include warning systems, control works (such as levees and coastal barriers), building design, planting and cropping practices. Or finally they may choose change, which would likely include a recognition that the previous two options can be at a heavy social cost. Instead people may engage in a change in practice (like a shift in agricultural practice) or a change in location, which can include a full migration of a community. Clearly if this has been observed to be a useful framework for possible choices made by people in a potential disaster context, then it would be of great value to discover more about what might make a given person select one or other of the above courses of action.

Another observation offered by Burton et al (1993) is that when faced with a hazard event people will use precautionary actions taken on previous occasions, or may use a more systematic review of possible alternatives, so that whatever happens, some kind of choice is involved. So how to people make these choices? The answer given here is that "Much of the process of judgment and choice is still the object of speculation" (p.62). It is pointed out here that psychological and economic theories about choice do not tend to be consistent with each other and this point will be revisited during the section on the contribution psychological theory to the current set of problems.

As further reinforcement to the need for a more in depth understanding of how people make choices in the natural hazard environment, Burton et el (1993) also says "If it were known precisely what processes people follow in choosing among the options open to them, it would be easier to isolate the factors influencing their final choice." (p.62). Also, whilst it is unlikely that people will ever have full information about the potential event and all of the courses of action available to them, "There is a tendency to expect that people left to themselves with enough information will select the optimal adjustments." (p.65). In reality there has been plenty of evidence from around the world that this is far from the case and highlights yet again the need for a focus on human choices in addition to predicting the events.

Another important point made in relation to choices made at different levels of society in that national coping may be different from individual coping if government strategies, especially in developing nations, give economic factors higher priority than, say, psychological ones. In other words, choices available to individuals may be constrained not only by the event but by the relative priorities of those who manage the risks. This is likely in turn to have an impact on perceptions of and trust in those authorities and therefore the actions people take.

It is acknowledged that there is a wealth of opinion as to why people may do what they do in the context of natural hazards, often based on direct observation but it is nevertheless still asserted that "If it were known precisely why people select some information and ignore other information, much social behaviour could be explained." (p.96). It is pointed out that in earlier days, it was

assumed that people who appeared not to respond to warning messages and put themselves in danger are either selfish or stupid. This belief is still held by many and this was personally witnessed by the author through comments made by those who evacuated for Hurricane Ike about those who did not. This may well be, however, because explanations so far have been too simplistic and because such explanations are easy they have been used to inform public policy even though they may be misleading. Although complex and therefore more difficult to tease out, more complete explanations therefore need to be sought.

White (1974) refers to the fact that field studies on which kind of people adjust to different hazards in which kind of ways mostly raise more questions than they answer. Also, methodological limitations have been noted such as the fact that mainly heads of households were selected for interviews or surveys and were usually also men. Field studies have usually been restricted to sociology and anthropology and therefore whole communities or groups of people, rather than individuals. All of these factors have been taken into consideration in designing the current set of studies in order to fill as many of the identified gaps as possible.

The fact that perceptions differ greatly between people living directly with the risks and those studying them is also identified as an important factor in understanding some of the misunderstandings. "What is generally true is that people living in hazardous areas have different views than of the hazard than does a scientist studying the same natural phenomena. They are not necessarily "incorrect" in their appraisals of the events; they pay attention to different characteristics and often deal quite differently with probabilities. Indeed, given their particular needs, they may arrive at more accurate or useful appraisals than the "experts"" (p.111). This could include, for example, the neglect by policy makers to consider the importance of place attachment in their understanding of evacuation behaviour if they themselves do not have a strong attachment to place in the same way. For example, policy makers at a high level may have chosen to follow a career path that has required frequent relocation, to such an extent that he or she has forgotten to even consider how important place may be to communities who have lived in the same place, or even house, for generations. This can also be a cultural factor, or indeed socio-

economic. Communities in some of the countries visited by the author displayed a much stronger attachment to community and place than did those in others and it would be useful to know what impact this has, if any, on preparedness behaviours. For example, "People don't always consider economic loss first. On the cyclone torn shores of Bangladesh, people place heavy weight on maintaining family and community ties even at the expense of income." (p.119).

It is stated by Burton et al. (1993) that four classes of factors have been found to be associated with decision in a number of areas:

1) Prior experience with the hazard
2) Material wealth of the individual
3) Personality traits (e.g. sense of inner control)
4) Perceived role of the individual in a social group.

These classes of factors are consistent with much of the evidence gathered in other literature and through time spent in communities at risk and are therefore useful in the design of the current study. The second is clearly more of a contextual factor and therefore not directly relevant in social science studies, but nevertheless worthy of acknowledgement amongst other situational factors. The others have been mentioned at various points in the introduction so far, for example the women who had moved to 'tornado alley' with prior experience of other hazards that reportedly impacted on their feelings towards tornado risk. In relation to point 4) was the observation by Jane Gilbert that in Africa people's perceived role in the community was closely tied in with their self-concept and therefore the choices that they made.

Heberlein's theory (1971) says that choice is affected by a sense of responsibility and possible remedial action. In other words, action can be a function of how socially responsible someone feels, and his/her capacity to act whether real or perceived. This further reinforces the importance of understanding the individual in their social context rather that in isolation.

Also on the same theme, Mileti (2004) says that "When the physical environment is too complex or rapidly changing, people tend to be influenced more by other people than by the physical reality of the hazard itself" (p.148). He also points out that whilst more work has gone into understanding people's

actions immediately prior or after an event, much less is known about what motivates people to engage in and sustain preparedness actions whilst the threats are not immediate. Public awareness campaigns usually happen in the context of a near term threat, e.g. the start of hurricane season and in general it is observed that people have a tendency to address imminent issues rather than longer term threats.

In a book entitled "At Risk", Blaikie et al (1994) reinforces the potential value of understanding the role of traditional or indigenous knowledge in the context of natural hazards and suggests that in many cases this knowledge "provides the basis for much coping behaviour, and patterns of coping themselves" (p.70). He goes on to point out that is very important to understand the ways in which this type of knowledge may interact with official disaster management policies as without this, many mitigation policies may continue to be clumsy and pay little attention to what ordinary people at community level actually do.

All of the above literature offers further insight into the specific areas in which new research is required and in addition offers many suggestions as to the questions to ask and even some of the possible answers to be investigated in a more systematic way. Before moving onto the role of psychology there is a further section to be addressed. As pointed out by the ICSU research plan, there is a close relationship between weather related natural hazards and the newly emerging threats posed by climate change. This relationship has to date, however, due to academic and policy boundaries, not been addressed in any depth. Given the questions posed by the gaps in knowledge so far it was decided to include a small section on climate change in this study in order to explore some of the possible relationships between the ways people view natural hazards and climate change. As for the literature of natural hazards and disaster management, the literature on climate change is vast and rapidly expanding and therefore only a small selection in presented here in order to introduce the theme and examine the most useful questions to be addressed.

Climate Change

As an example of a new thrust towards addressing the potential overlap of knowledge and information around natural disasters and the longer term and slower onset threats posed by climate change, Tompkins & Hurlston (2005) looked at national government responses to hurricanes in the Caribbean in order to seek lessons that may be transferable to adapting to climate change. The literature from the disasters field suggests that a lack of preparedness for environmental hazards will always worsen the impacts of those hazards. Since Blaikie et al (1994) produced their 'pressure-release' model, most disaster experts agree that disasters are largely socially constructed." (p.3). They reinforce the opinion that the mechanisms underlying behaviours in the context of natural hazards and climate change are complex and not well understood. In addition, they point out the very obvious link that in the future, one of the ways that climate change is expected to manifest itself is in the form of an increase in extreme weather events (EWEs).

Diekmann (1998) discusses a disaggregation of 'environmental behaviours' and shows that there are large discrepancies across different types of behaviours, rather than a general tendency to engage or not engage in 'pro-environmental' behaviour. This may or may not be the same for 'pro-environmental attitudes' but would be an interesting point for investigation. Clearly, attitudes towards climate change are only one aspect of environmental consciousness and therefore may or may not relate to other measures of general environmental attitudes but as an exploratory endeavour information could be gathered on a range of attitudes and beliefs in relation both to climate change and to the wider natural environment in order to look for initial relationships and identify questions for more in depth future research.

Diekmann's (1998) findings in relation to discrepancies between attitude and behaviour in the context of climate change may be comparable with data relating to EWEs, for example the tendency to bias the view of one's own behaviour as more co-operative than others, and others' as more 'defective'. In

other words to over-estimate one's own contribution and underestimate others. It is possible that this could also be the case for protective behaviour in the context of risks of extreme weather. Also in Diekmann's work was the finding that many people required others to engage in the same behaviours in order not to feel helpless and to feel that their own contribution is not valid if it is carried out in isolation.

Kempton et al. (1999) "Environmental Values in American Culture" looked at weather, climate change and general environmental attitudes through interviews and surveys targeting select groups in the USA. Their findings are very useful for comparison with these studies presented in this project, but dates are significant in that global warming and climate change were relatively new and not yet widely understood concepts and this will undoubtedly have had an impact on the attitudes that were prevalent at the time compared to now.

Other points worthy of consideration in researching attitudes and beliefs about climate change alongside those relating to EWEs include the dilemma that to some the degree of uncertainty as to the actual impact of climate change can lead to the logical decision that it is safer to do nothing, which may be very different to the way in which EWEs are viewed. Therefore, when it comes to climate change per se (rather than the specific impact it may have on the occurrence of, for example, EWEs), it is important to address the issue of how people adapt to uncertainty rather than to a known threat, as coping strategies will by necessity be very different. In this context, 'soft' strategies, such as early warning, evacuation and insurance, may be better than 'hard', such as the building of physical defences.

The risks posed by climate change are vast and only beginning to be understood and considered, so for the purposes of this study the theme is limited to a small initial investigation into attitudes towards climate change both as valuable information in its own right and for initial comparison with data relating to EWEs. The details of this will be presented later alongside the other study themes.

So, the information gathering stage outlined above led to the emergence of a number of themes that would benefit from more systematic research; individual attitudes towards the hazard and its management, the role of prior

experience, attributions of responsibility of and for self and others, trust, engagement in preparedness behaviours, community and place attachment and attitudes towards climate change and the wider natural environment. Alongside these themes are the additional elements of cross-cultural and cross-hazard environments that have been identified as lacking in much of the previous research. These themes will be returned to following an introduction to the specific role of psychology, distinct from the other social sciences, in fulfilling some or all of the identified research aims.

The Role of Psychology in Disaster Risk Reduction

To date, psychology has played a significant role in the management of natural disasters when they occur due to the well-researched issues around trauma and rehabilitation. There has, however, been relatively little psychological research into how people adapt to living with hazards and make decisions amidst the uncertainty of an ever changing and increasingly unpredictable natural environment. As stated previously, assessments of community vulnerability and behaviour have largely been based on the assumption that behaviour is a function of the context, with some consideration of socio-economic factors (such as whether the community have the option to live elsewhere for example), but with little consideration of how individual differences may influence people's engagement in proactive behaviour to reduce possible impacts of a disaster.

In order to gain a better understanding of the factors involved in individual behaviour, there will obviously be a need to acknowledge the many external, environmental differences experienced by communities living with natural hazards in different parts of the world. For example the extent of the risk, the possible magnitude of an event, the range of choices available for alternative locations to live and financial constraints around proactive behaviour involving physical changes to homes and businesses may all have a role to play in decision making. Also, previous experience of a given hazard is likely to have an impact on future adjustments behaviours in the face of a repeat threat.

Political and socio-economic factors also play a significant role in how and why people may respond in the way they do towards the risk of extreme weather events, as do religious beliefs. For example, a community may be more likely to give consideration to the expected level of assistance offered by the government or local authorities in deciding how they will best be able to protect themselves and the degree to which they trust those giving them the risk information. Other factors, such as the level and type of insurance cover and the extent to which any given household feels able to rebuild their house should it be destroyed, may influence the likelihood of evacuation.

Psychology has a unique and valuable place in developing a better understanding human responses to the risks associated with natural hazards. It is common for those involved in formulating risk communications and policy to refer to "people" when describing the end users of their products. Whilst it is clearly not a realistic option to consider the needs and characteristics of every single unique human being, the alternative has often been to head straight to the other end of the spectrum and seek to cater to the "lowest common denominator", or the perceived general characteristics of a given population, or indeed the species as a whole. Many of these characteristics are decided upon through unexamined assumptions however, and the result can be products that cater to some kind of average person who may or may not even exist in reality and will therefore miss large (and often more vulnerable) segments of the population. So far, most social science research designed to offer a better understanding of the human factors affecting disaster mitigation and preparedness has been designed to examine influences brought about by group or community level factors. For example, geographers have examined contextual and demographic factors relating to location, anthropologists have focused on culture and sociologists have largely sought to explain behaviours through group membership, identity and dynamics. Also, more and more of those originally trained in the physical sciences have observed the need to better understand human interactions with the hazards and have begun to conduct studies using theories taken from the social sciences. Clearly, also, there is much overlap between these approaches. Overlap also exists between current research efforts in, say, anthropology in that whilst an examination of cultural influences remains the central focus, individual difference in the

adoption of certain values, beliefs and practices are a necessary and important secondary consideration in building a more complete picture. For this reason, many studies of adaptation to changing environments have included measures of individual difference (e.g. Kempton et al., 1999) that provide some of the groundwork for developing research questions that draw on the specific tools and theories available in psychology. These studies from other social science disciplines, combined with the gaps in understanding human responses identified by those who work in delivering risk messages and formulating policy, have allowed for the identification of a wide range of theoretical frameworks from psychology which may be of use in this context.

To date the number of studies applying pre-existing psychological theory to the natural hazard context has been small and has generally emerged from the field of social psychology, but for such a small number these studies have also been diverse in the approaches they have used. This makes it difficult to bring the findings together in a coherent manner in order to take the next step in designing future studies from them, which incorporate enough of the many inter-relating factors that clearly contribute to the way in which people behave in this context. These studies have generally used specific strands of theories developed in other contexts, mainly as a result of the area in which the researchers have previously focused their work, and they do provide useful information relating to specific theoretical areas. These will be reviewed to give an overview of the applied work already carried out by psychologists. Then, an outline of the main research themes to be explored in this study will be presented, followed by an overview of some of the relevant theoretical literature that has been developed and tested in other contexts. This will be useful in shaping the current study design despite, as already discussed, not providing a central theoretical framework so that the design may remain exploratory and therefore not confined by very narrow hypotheses.

Mulilis and colleagues conducted a number of studies in the USA between 1990 and 2003 examining how certain theories can be applied to preparedness action in relation to both tornado and earthquake risk. Mulilis & Lippa (1990) looked at earthquake preparedness due to negative threat appeals and tested the application of protection motivation theory. Data were collected in California and used manipulations in threat messages sent by post and

examined the results on preparedness behaviours. Significant differences were found depending on whether a message was manipulated towards the subjective probability of a large earthquake, the expected severity of earthquake damage, the perceived effectiveness of earthquake preparedness and perceived capability of preparing. The only dependent variable was the behavioural outcome in terms of preparedness actions.

Mulilis & Duval (1995) used a strand of coping theory named 'Person relative to Event' (PrE) theory in earthquake preparedness. The hypothesis was that fear arousing and negative threat appeals would be heeded more when they also included a way to help the subject to appraise their resources as sufficient to act on. The hypothesis was partially supported but results were stronger when responsibility for preparing was included. Mulilis & Duval (1997) further examined the moderating effects of responsibility on PrE coping in tornado preparedness. They found again that fear arousal messages lead to greater preparedness when they also lead people to appraise that they have adequate resources to employ. This was shown to be even more the case when people felt responsible for preparing.

Duval & Mulilis (1999) conducted a field study with people in a city, relating to earthquake preparedness and PrE theory. They found that PrE was generally supported in that preparedness increased as the threat increased but only for people who appraised their resources as sufficient relative to the level of threat. They pointed out the need to add perceived difficulty in preparing to the PrE model in this context.

Mulilis et al. (2000) studied tornado preparedness also using PrE theory and gathered data across home owners, renters and undergraduate students living in tornado risk areas. They point out that much of the preparedness research has been conducted with exclusively student populations and that this study was in part designed to gather data in at risk communities with a wider demographic representation. They report that some socio-economic factors already found to affect household disaster preparedness include income, education, gender, age, ethnicity (within the USA rather across national divides). The proximity to the disaster area also relates to preparedness. In this study, 'community bondedness' was found to have an effect and this is useful in

providing some initial confirmation of the importance of one of the themes identified earlier. Some researchers argue that that these factors are not as important in behavioural preparation as person and events variables such as the probably of event, severity of event, attitudes, perceived controllability, self-efficacy and more and this also points to themes that have been identified from other sources already.

Mulilis et al. (2001) concentrated on the role of responsibility in tornado preparedness. They observed that personal responsibility assumed for behaviour clearly affects behavioural outcomes for a variety of situations, and that personal responsibility is in turn affected by a large number of variables. However, limited research has been conducted to determine exactly what personal responsibility actually entails. They list duty, moral obligation, choice, and commitment as being central to the concept of responsibility but observe that few investigations have systematically varied more than one of these variables in a single experiment. They set out to examine the effects of both choice and commitment on personal responsibility assumed for, as well as behavioural intentions to engage in, tornado preparedness. They found that both choice and commitment were required to generate personal responsibility for and intentions to engage in tornado preparedness. Many parts of the questionnaire cover themes chosen for the current study, including personal responsibility scales, protective action measures and psychosocial variables such as perceptions of threat. The study results found no significant gender differences in level of preparedness or assumed personal responsibility for preparedness. Their hypotheses in relation to PrE were confirmed in terms of hierarchy of engagement in behaviours across the three samples and these hypotheses also covered problem-focused coping, which is a theme not looked at in the current study.

The outcome of Mulilis et al's work places a heavy emphasis on perceived personal control as a strong predictor of preparedness actions. It also proposes that some of the reason for students' lower engagement in preparedness activity may be down to other priorities, such as gaining independence. This may translate to other populations, such as in developing countries, in terms of the weighing up of other priorities such as income generation etc. against the perceived threat of the hazard event. The

assumption is also put forward that the causality direction goes from an appraisal of resources relative to the threat, to the level of personal responsibility assumed, to preparedness behaviour. They also include an acknowledgment that in future studies this assumption would need to be tested. The study also points to the need for further similar research across other types of hazards and other populations.

Finally, Mulilis at al. (2003) explored the role of prior experience on tornado preparedness in an attempt to better understand the nature of the relationship, beyond the mere acknowledgement that it has some effect. They included pre- and post tornado data from similar populations which have been rare in previous studies and found that preparedness was significantly increased following tornadoes. Appraisal of threat and perceived responsibility also increased after the tornadoes. Studies led by Mulilis could not be found later than 2003 and further investigation led to the finding that he and Duval had both passed away in early 2002. These sad departures clearly left a significant hole in the field of applied social psychology in the context of natural hazards.

Lindell and Perry (1997) reviewed twenty five years of research on preparedness, mainly for earthquakes in the USA. This and other reviews (also covered in their review) conclude that household factors directly affect preparation and hazard and experience appear to indirectly affect actions. Levels of perceived responsibility were also found to be important and would predict then that homeowners would be more likely to prepare than renters. See also Garcia (1989) for an overview of earthquake preparedness indicators in households in California.

Further studies were found that were interesting in terms of being amongst the small number of attempts to apply psychological theory to the context of the natural environment. These include Diekmann & Priesendorfer (1998) who examined the gap between aspiration and reality in environmental behaviours. The study was conducted in Switzerland and Germany and identified three cognitive strategies to bridge the gap between environmental attitudes and behaviours; attention shifting strategy, low-cost strategy and subjective rationality strategy. Also, Dunlap (1998) examined results from a 1992 Gallup poll in six countries (Canada, USA, Mexico, Brazil, Portugal and

Russia) about global warming beliefs. Most agreed it was happening but did not see it as such a big problem as ozone depletion and de-forestation (but this may be in part due to the political and media coverage of these latter issues at at the time.) It was also noted that views did not differ greatly across social strata within the nations. Motoyoshi (2006) conducted a study relating to flood risk in Japan. They did not use specific theory but offered the observation that the ability of communities to prevent disasters has declined as nuclear families have increased, traditional communities have declined and the number of solitary, live-alone old people has increased. They therefore highlight the need to involve communities in disaster prevention planning and this is relevant to the current study's interest in examining the role of community in preparedness. Peacock et al. (2005) looked at hurricane risk in Florida. They show that hurricane risk perception has been found to be an important predictor of storm preparation, evacuation, and hazard adjustment undertaken by households, such as shutter usage. Planners and policy makers often employ expert risk analysis to justify hazard mitigation policies, but expert and 'lay' risk assessments do not always agree, as discussed earlier. Because the public is increasingly involved in planning and policy decision-making, consistency between "expert" risk assessments and lay perceptions of risk are important for policy development. This paper looked at factors contributing to hurricane risk perceptions of single-family homeowners in Florida and used data from a state-wide survey. They examined the influence of location on homeowner perceptions along with other factors including knowledge of hurricanes, previous hurricane experience, and socio-economic and demographic characteristics. It was found that there is a good deal of consistency between residing in locations identified by experts as being high hurricane wind risk areas and homeowner risk perceptions.

Also on the theme of past experience, Siegrist & Gutscher (2008) showed that past flood experience is important in motivating mitigation behaviour. They examined affected versus not affected (but also living in flood prone areas) samples and found differences in how they envisage flood consequences. Non-affected people strongly underestimated the negative affect associated with flooding and the recommendation is offered that communication

must therefore not only focus on technical aspects in order to trigger motivation for mitigation behaviour but must also help people envisage affect.

Paton (2003) and Paton et al. (2003) studied disaster preparedness from a 'social cognitive perspective' by using theory from health research on protective behaviour. They took pre-existing models and expanded on them to produce a social cognitive model of disaster preparedness. He includes in this framework the factors that motivate people to prepare, the formation of intentions and finally decisions to prepare. This model concentrates mainly on a cause and effect sequence designed to predict behavioural outcomes. Paton et al. (2001a) and Paton et al. (2001b) also looked at prior experience and community resilience from a cognitive processes angle.

Asgary & Willis (1997) looked at household behaviour in response to earthquake risk in the form of an assessment of alternative theories. This was a review of the main theories and found more support for cognitive and cultural theories rather than economic and 'need' theories of earthquake safety measures. They concluded that the adoption of mitigation behaviour can therefore be encouraged in terms of cognitive processes through information and education and this provides further reinforcement for the value in using psychology to fill some of the gaps in understanding identified in this review so far.

Also transferring work conducted in health studies, Weinstein (1989) looked at the effects of personal experience on self protective behaviour. This paper reviewed a number of risk mitigation scenarios and behaviours including seat belt use, criminal victimization other than rape on individual crime prevention efforts, natural hazards experience on both natural hazards preparedness and compliance with evacuation warnings and finally myocardial infarction on smoking. Most studies report no effect of prior experience (mainly hurricanes and floods) on response to evacuation recommendations (e.g. Baker et al, 1976; Dooley et al. (1992); Hanson et al, 1979; Perry, Lindell & Green, 1991; Wilkinson & Ross, 1970; Windham, Posey & Spencer, 1977). It is stated in the review, however, that anecdotal evidence suggests that people in reality take whatever action would have been appropriate for their last experience. These kinds of conflicting conclusions are common in the literature and highlight

the need for a more comprehensive evaluation of the factors involved and how they interact and are explored in Weinstein & Nicholich (1993).

These studies carried out in applied social psychology in the natural hazard context, whilst still few in number, add value to the current project by confirming the importance of certain themes but are limited in that the methodology has been to select a specific theory that has been developed in another context and apply it in this one. As mentioned earlier this conventional approach, whilst clearly valuable in testing the application of current theories in a new context and reinforcing their general value, has been discounted for the current study in favour of a more exploratory design driven by a wish to bring together a more cohesive structure within which to address a real world problem.

So, given the disjointed nature of the themes covered by these previous studies and the number of potentially relevant theories across the many sub-disciplines within psychology, this approach feels somewhat hit and miss in addressing the issues identified here. Equally, to build on the very specific findings of these previous studies seemed unnecessarily limiting given the number of factors identified above that are not considered in the papers published in psychology so far. So, given the number of themes identified in the earlier information gathering phase, the approach adopted in this study is therefore not to identify all of potentially useful psychological theories, select one or two based on apparent best fit and then test a small number of specific hypotheses in this particular context, but instead has been designed as an exploratory study that will seek to identify emerging themes and relationships so that more specific questions may be developed and tested as a result. In other words, it seeks to be more of an in depth information gathering phase in order to build on the material gathered in communities and from experts and to provide a clearly foundation for the development of future psychological research in the context of natural hazards. It is therefore not designed to answer specific theoretical questions and hypotheses at this stage.

As a result, the design is somewhat of a break from convention in psychological research methodology, but this has been carefully evaluated against the pros and cons of a more traditional approach. The conclusion was

that in this early stage of applying psychology to the context of natural hazards, the time taken to establish themes and relationships more clearly will be valuable in providing a clearer focus and making best use of the wealth of theory available for future application. Therefore, the intention is that the results of this study can be used to target existing areas of psychological theory once armed with more specific material, questions and ideas.

The design of this study is therefore not predominantly literature based, with the literature being used instead to illustrate the gaps in research to date and to give examples of the type of research conducted so far. The content will be compiled instead by drawing on the information presented from the real world experiences and observations and from the gaps identified by those working directly with disaster management issues. The methodology is predominantly quantitative in order to provide information on statistical relationships within and between themes, but in many ways the principles are more in line with grounded theory due to the intentions outlined above. The intention is to take a first step, based on themes gathered and presented so far, in seeking to provide a clearer set of themes and questions by exploring attitudes, beliefs, perceptions and behaviours in the unique context of weather related hazards.

As mentioned earlier, also important before taking the identified themes forward into the stage of study design is an acknowledgement of the range of possibly relevant areas of existing psychological theory. Whilst it has been decided not to rely heavily on existing theory in the design, in order to explore new factors that may not yet have been given due consideration, an overview of the areas from within psychology is useful at this stage in providing a framework in which to place the findings and design further studies so that they capitalise on the strengths that the discipline has to offer. Considering the breadth of themes already identified and outlined earlier in the chapter (attitudes towards the hazard and its management, the role of prior experience, attributions of responsibility of and for self and others, trust, engagement in preparedness behaviours, community and place attachment and attitudes towards climate change and the wider natural environment), there are a large number of areas from within current psychological theory to which they may usefully be related. It is therefore not possible to review the full extent of this literature here. Instead,

an overview of those areas selected as most relevant to the themes is provided, whilst other areas are mentioned so that they may be returned to for future study design following initial findings.

Risk Perception

Risk perception has traditionally been chosen as a start point in understanding the way in which people make choices in relation to hazardous situations, but there will not be a strong emphasis on it in this study for a number of reasons. Firstly, the field is vast and often the way in which a risk is perceived is given more emphasis than the myriad other factors that may be at play in a context such as this. Also, the term 'risk perception' is often not given a clear definition and becomes an umbrella term for a number of other concepts as chosen by the researcher in any given study, or it is given different definitions depending on the questions posed by the researcher and the literature chosen in the review. An interesting example of the ambiguity of the term 'risk perception' can be found in a number of studies of volcanic risk perception in which communities are described as having 'low risk perception' (e.g. Gregg et al., 2004). In these studies no clear definition is provided and yet the concept has clearly been given quantitative rather than qualitative properties, but on a scale designed for the specific aims of the study. In the absence of an agreed definition, the concept therefore becomes whatever a given researcher decides it to be, or just a generic term for a range of possible measures and factors, and therefore loses any value in being compared across studies. 'Low risk perception' could be interpreted as a perception that the hazard in question is not that dangerous, that the level of danger to the people studied was perceived to be low, or that the level of general knowledge about the hazard is low. These explanations are distinctly different form each other and without a clearly stated definition, value of the research is diluted. This and other difficulties are discussed in Davis (2005).

The concept of risk perception first entered the academic world in the 1960s as a response to difficulties in managing public responses to nuclear

power (Sowby, 1965; Starr, 1969). It then grew rapidly as the concept was applied to a range of technological hazards and then to individual risk choices, such as smoking, wearing seat belts and other activities that were considered as 'risk' behaviours. Three distinct approaches to the concept emerged and are still a matter of significant debate to this day. Cultural theory (Douglas, 1994) was developed by an anthropologist and focuses on the effect of cultural biases on perceptions of a risk object or situation. Whilst initially gaining much support through collaborative research (Douglas & Wildavsky, 1983), cultural theory soon became heavily criticised, mainly due to a lack of empirical support (Sjöberg, 1998; Marris et al., 1998).

Initial work on risk perception was carried out from within engineering and maths, as they were responsible for risk assessment work relating to new technologies, but soon noticed that public perceptions of the levels of risk posed by new technologies were not matching the expert calculations. Social science then took on the study of 'risk perception' but ideas were developed more or less simultaneously in anthropology, geography, sociology and psychology. For this reason no one agreed definition of 'risk perception' was agreed at the outset and instead each discipline followed its own. Also, the theories that were developed all came with strengths and limitations of each individual discipline. From anthropology came 'Cultural Theory' (Douglas and Wildavsky, 1983), from sociology and geography was an approach later called the 'ecological approach' (See White, 1974 and Burton et al., 1993) and from psychology the psychometric paradigm was developed (Slovic, 2000).

Cultural theory focused on the role of cultural norms on the way in which risk is perceived and has been subject to much criticism mainly, as already mentioned, for the lack of empirical findings to back it up (Brenot et al., 1996; Sjöberg, 1995; Sjöberg, 1998, Marris et al., 1998), although some studies have supported the theory (Dake (1991). Whilst clearly weak at an empirical level, at a theoretical level it does point out the tendency of psychological approaches to omit social processes in studying how risk is perceived; ""Human psychology tries to separate habits and emotions (such as fear or excitement) from the testing of cognition. In such tests, human tend to perform in ways that call the basic concepts of rationality into question. Research then focuses upon the inadequacy of the human perceptual apparatus, upon dysfunction. The social

processes involved in concept formation need to be systematically included in studies of public risk perception." (Douglas, 1985, p.29).

Equally, the ecological approach has been attacked for lacking and framework that can be empirically tested (Douglas, 1992). The view here, however, is that both cultural theory and the ecological approach call for due attention to be paid to the interaction of contextual factors such as culture and environment in understanding how individuals perceive risk.

In this project, the focus is on the role of psychological research in the field of natural hazards so the most relevant approach to risk perception is that of the 'psychometric paradigm' (Slovic, 2000). As mentioned earlier, risk perception work began with an interest in people's understanding of probabilities of an event occurring combined with expected losses, as calculated by scientists and engineers. When people did not seem to hold the same perceptions they were first deemed to be irrational and or not to understand the risk. This then led to a large push to understand why 'lay' perceptions of risk differed so greatly to those of the 'experts'. Of the three main theoretical frameworks that emerged, the psychometric paradigm was the first to quantify perceptions of risk and therefore proved popular with scientists and engineers involved in quantitative assessment of the risks themselves, as this field of enquiry was able to sit more neatly with their own approach and methodologies.

Since the emergence of the field of risk perception research however, the subject has been fraught with arguments as to the quality of each theory and its accompanying methodology. The psychometric paradigm has often been at the centre of much of this criticism (for an in-depth critique, see Sjöberg, 2004). With its focus of the quantitative measurement of risk perception, the psychometric paradigm largely gained its acclaim through calculating mean scores across a range of different 'risks' and across the entire sample in any given study. This means that scores for individual respondents and individual risk items are not used, giving only an average score for a very general concept of risk perception. If the goal is to provide a quantitative measure of the tendency towards high or low perception of risk in general across a give population, then this methodology has been tried and tested using carefully

selected scales. The paradigm was developed "to identify attributes of risk, which were shared universally by all individuals" (Sjöberg, 2004, p.17). It did not, therefore, attempt to distinguish between individuals or groups, apart from an 'expert' and 'lay people' distinction. If the goal, as it is in this study, is to examine individual differences in the perception of a specific risk event, then this paradigm and the associated literature is clearly of limited use. Douglas (1992) points out a further limitation in the psychometric paradigm in that it attempts to analyse perceptions of risk in isolation from some of the most important factors that are likely to influence it; "You will find that the dominant psychological theory of risk perception gives little clue about how to analyse political aspects of risk. Indeed, reading the texts on risk it is often hard to believe that any political issues are involved." (p.38). One of the major criticisms levelled at the psychometric paradigm is that it focuses exclusively on the individual without taking into account the context in which individuals are exposed to risks (Douglas & Wildavsky, 1983; Barnett & Breakwell, 2001).

Work by Slovic and colleagues has been groundbreaking in understanding perception of risk more fully as a general concept but often by focusing on certain factors at the expense of others, which limits its value in this context (Slovic, 2000).This has to a certain extent been acknowledged in studies that attempt to broaden the factors considered (Fischhoff et al., 1978; Slovic et al., 1987; Peters & Slovic, 1998). Slovic & Weber (2002) did, in fact, specifically examine risk perception in the context of extreme events. They point out that the perception of risk is an important factor in how people make decisions on how to respond to that risk this has indeed been shown to be the case in many studies. It is, however, an extremely broad theme and it is pointed out by Davis et al. (2005) that it is also not clearly defined and therefore can become a rather ambiguous concept which can in turn dilute its value unless this is addressed. It has, therefore, been the subject of much debate and given the observations made in the hazard context as to how people seem to be considering so much more than the threats posed by the hazard itself, the role of risk perception is not given much emphasis here in order to give due consideration to these possible additional factors.

This leads on to a more generic point about the study of 'risk' per se. A widely used definition of 'risk' is "(Exposure to) the possibility of loss, injury or

other adverse or unwelcome circumstance; a chance or situation involving such a possibility" (Oxford English Dictionary). The definition of 'hazard' is "Risk of loss or harm; peril, jeopardy). Already there is ambiguity in the distinction between 'risk' and 'hazard' given that 'risk' is the first word in the definition of hazard. By contrast, in DRR literature the word 'hazard' is more usually used to describe the entity that is posing a threat (e.g. a hurricane, tornado or other extreme weather event), whilst the 'risk' is the probability of an event bringing about adverse consequences (See Burton et al., 1993). This further ambiguity is also pointed out by Douglas (1992); "'Risk' is the probability of an event combined with the magnitude of the losses and gains that it will entail...From a complex attempt to reduce uncertainty it has become a decorative flourish on the word 'danger'." (p.40). In order to be free of this definitional minefield, Douglas (1985) even goes as far as to change the term 'risk perception' to 'risk acceptability' in order to avoid the definitional problems and ambiguity surrounding it. She further points out that the Japanese do not have a word for risk, as instead they address the individual problems and dangers directly (Douglas, 1992). In this way, they do not attempt to provide and conceptual and theoretical model of 'risk' across different situations, but rather seek to understand the threats posed by and response to each object and event in its own unique context. It has also been pointed out that other factors, such as perceived seriousness of consequences may be more useful in predicting demand for risk mitigation than perceptions of the probability of an unwanted event occurring (Sjöberg, 2000b).

Following on from discussion on definitions of the word risk, 'Perception' is defined as "The process of becoming aware or conscious of a thing or things in general; the state of being aware; consciousness" or "The capacity to be affected by a physical object, phenomenon, etc. Without direct contact with it; an instance of such influence" (Oxford English Dictionary). In contrast, the definitions of 'risk perception', where given at all, include concepts that are far more broad and inclusive than a mere awareness of a hazard or risk object. For example, one definition from the literature on the perception of technological risks is; "Risk perception involves people's beliefs, attitudes, judgements and feelings, as well as the wider social or cultural values and dispositions that people adopt, towards hazards and their benefits." (Pidgeon et al.,1992, p.89).

This definition acknowledges and allows for the inclusion of a much wider range of psychological, as well as societal and cultural, factors to be considered, such as the formation and role of attitudes and affect, plus beliefs systems that may include religion and social and cultural norms in any given society. Such a definition then allows for the inclusion in any empirical research of complimentary theoretical areas such as social judgement (Eiser, 1990), which in turn acknowledges the importance of taking into account factors such as heuristics and biases (Tversky & Kahneman, 1974) in determining how an individual may arrive at a judgement about an object to which he or she is exposed. Again, however, over emphasis on a very specific theoretical can be dangerous. In this case, for example, heuristics and biases are assumed to be a matter purely of perceived probabilities and this can be a very limited perspective in a context such as natural hazard management where so many other factors than the chance of an event occurring and causing damage and loss will undoubtedly be added into decision making strategies.

In considering the wider range of possible factors included in a less constrained definition of risk perception, a number of other theoretical areas may be considered of value. For example, social judgement and attitude theory (see Eagly & Chaiken, 1993) do not consider the concept of risk, but instead seek to understand how individuals evaluate and respond to objects and situations to which they are exposed, and approaches such as this are therefore free of the definitional problems discussed so far. Such frameworks also seek to understand the link between evaluations and behaviours, which is another observed limitation of traditional risk perception approaches (Sjöberg, 2004). These theoretical areas are also extensive in terms of the available literature and are therefore confined to an acknowledgement at this stage as they cover objects and situations across a far wider context than that of risk of natural hazards. They are, however, theoretical areas that may provide valuable insight and direction beyond this exploratory stage when thematic areas and research questions are more clearly defined for further studies.

Returning to the theme of risk perception, then, Pidgeon's definition is only one of many individual definitions of the concept. So, until or unless a clear and accepted definition of 'risk perception' can be agreed, at the very least between those studying the concept within the field of DRR if not in the wider

conceptual context, then the whole theoretical and empirical field as discussed in the literature is of very limited value in an applied context such as this. Douglas (1985) even goes as far as to change the term to 'risk acceptability' in order to avoid the definitional problems and ambiguity surrounding risk perception. A further point worthy of consideration in applying risk perception theory to the context of natural hazards is made by Sjöberg (2004); "Risk Perception came to be seen as an obstacle to rational decision making, because people tended to see risks where there were none, according to the experts." (p.8). This is in fact the exact opposite of one of the central problems in disaster risk reduction, where often it is the local people who do not appear to see a hazard as dangerous and therefore do not take precautionary measures, whilst the experts have calculated a relatively high level of risk and are seeking way to prompt action from the communities at risk. This is one of the central questions in this study – do not people fail to act because they do not perceive that they are at risk, or do they have an accurate perception of the risk but do not take action for other reasons? It is these other possible factors that are central in this study rather than the perception of the risk itself, although measures of the degree to which people feel that they, their families and assets are in danger from a hazard are needed for comparison with other relevant factors.

It is therefore the intention in this study to take a step back from the conceptual minefield that is risk perception and take a more specific approach to understanding the way in which people respond to the particular threats posed by extreme weather events. This then allows us to examine less ambiguous concepts within the general concept of risk perception, such as the perception of EWEs and the threats they pose, the role of prior experience, trust, gender, self-concept and self-efficacy, all of which have been discovered to play a part on how people respond to natural hazards as discussed in the earlier review of the applied social psychological literature. This would be within the limits also of the definition as provided by Pidgeon (1992) and allows for a much broader range of considerations than would be allowed by a direct interpretation of dictionary definitions of 'risk' and 'perception'. As a further indication that earlier definitions have been unnecessarily restrictive, Sjöberg (2000a) also talks about attitudes in relation to risk perception and stresses the

importance of including concepts such as these in any future research in order to address the true complexities of the issues. For a discussion in favour of further risk perception research in developing policy, see Pidgeon, 1998.

It is then simpler then, and more useful for the purposes of this study, to include a small number of specific measures both of the perceived chance of an event occurring and the perceived level of threat and/or danger and to examine these in relation to the many other factors at play in the complex and multi-faceted hazard contexts that are the target of the current piece of research. The way in which such measures are to be incorporated into the study will be discussed in more detail in the questionnaire development chapter. One simple hypothesis that may easily be incorporated into the design of this study from the risk perception literature is that of gender differences. It has been found that in many quantitative surveys of public risk perceptions, women respondents typically report higher levels of concern about environmental and technological hazards than men (Pidgeon et al. 2003). They also points out that the current literature is inadequate in offering explanations for the observed relationships between gender and risk perceptions, so a study that seeks to explore relationships between gender, perceptions of risk and other factors relevant to response to natural hazards is of clear value.

Community and Place Attachment

As identified both in the literature and from personal experience with populations at risk, place attachment is an important theme and work from environmental psychology has much to offer in this theme. Applied research is again more useful than experimental, albeit carried out in a different context. Billig (2006) looked at place and home attachment of Jewish settlers in the Gaza Strip during hostilities that posed a risk to the settlers' lives. Despite the danger, it was found that many settlers chose to stay and this was related to a strong feeling of attachment to place, an ideological view of the land, strong religious beliefs and a low perceived levels of risk. It would be fair to assume that some or all of these factors may be at play for people exposed to other

types of risk in their environment that threaten their ability to continue to live safely in the same place.

On further exploration into the theoretical literature it was, however, found to be another area fraught with conceptual difficulties (Hidalgo & Hernandez, 2001). In particular, the distinction between community and place attachment is not clear as both may relate to attachment to a physical location (the house, street, neighbourhood or town/village) or to people (family, neighbours, wider community). A sense of community has been linked with subjective well-being (Davidson & Cotter, 1991), but the degree to which this may impact on disaster preparedness or risk perception does not appear to have been explored in the context of EWEs.

Previous to an exploration of this literature, which is mostly from environmental psychology, another conceptual area was explored for the same purposes but was also found to be extremely difficult to pin down conceptually in order to apply it to the context of natural hazards. Having recognised the importance of conducting research across different cultures as well as different hazard types in order to move towards a more complete picture of the factors influencing response to natural hazards (Twigg, pers.comm.), self-concept was initially explored as a way in which to examine cultural differences in how relationships with place and others may affect how people evaluate and respond to threats in the natural environment. This exploration led to an examination of the different self-concepts with a view to hypothesising about they might lead to individual and cultural differences in an applied context.

Initially a review of self and culture (Markus & Kitayama, 1991) led to some interesting questions about how the interaction of the two may affect cognition, emotion and motivation. The cultures examined here were limited to the USA and Japan, however, and therefore it would have been an unnecessary stretch to apply specific theory or methodology to the current context. A review of this literature did however pose some interesting questions as to the way in which 'self-construal' may affect how people in different cultures respond to a hazard. For example, in a more collective culture such as Japan, it has been found that individual seek to be interdependent with others, whilst in the USA the tendency is much more strongly towards independence

and individuality. The implications of these differences are discussed in a review of both psychological and anthropological literature and many implications for emotion and cognition are found. The subject matter in this case is not relevant to the current topic, but the general question of relationship between self and other was recognised as an important factor, particularly in a cross-cultural context. This also raised the more general issue of considering implications of conducting cross-cultural research at all, and this subject will be returned to shortly.

A foray into the more general theoretical literature on self-concept allowed for further exploration of the theme. Three distinct self-construals were identified (Sedikides & Brewer, 2001) and this allowed for a move away for the restrictive dichotomy of individual and collective as discussed by Markus and Kitiyama. A third contrual is identified alongside 'individual self' and 'collective self' and labelled as 'relational self'. The distinction between collective and relational proved to be an important one in this context as the collective culture is Japan is far removed from the more relational idea of close communities found in much of the developing world. A recognition the importance of such differences led to the decision to include a question in the study as how self-concept and its accompanying relationship with others may relate to responses to natural hazards. The self-concept literature did not, however, provide appropriate scales for measuring it in this contest. In addition, it was also recognised that when examining responses to events in the natural environment, it could be of value to extend the idea of self-concept a step further to include the relationship with the natural environment. A body of literature was found on the 'ecological self' (refs) and it was during an exploration of this deeply philosophical literature that the idea of community attachment was discovered as a potentially more fruitful avenue for application in this context.

On discovering then that the field was beset with many problems very similar to those discussed in relation to risk perception, an important decision point was recognised. The early review of DRR literature and conversations with experts and with at-risk communities led to the identification of a broad number of themes in need of further exploration. Burton et al. (1993) provide a neat summary of the broad areas as presented earlier; prior experience with the

hazard, material wealth of the individual, personality traits (e.g. sense of inner control) and perceived role of the individual in a social group. Three of these four themes call for psychological research and all have been given further consideration in this review, but each potentially encompasses a substantial theoretical range. Add to this the conceptual difficulties discovered in many of the theoretical areas (such as risk perception and community attachment) and it already poses a great deal of difficulty in deciding on which theories to chose and also which scales of measurement to adopt. Further to this, if pre-existing scales were used to measure each thematic area chosen for study, then the resulting questionnaire would be far too long to be of practical use for data collection.

So, one option was to be more selective in which theoretical areas were used. This, however, would compromise the strength of the exploratory nature of the study in seeking to identify which factors, of the many included, provide the most value for further research. The other option was to include a broad range of thematic areas and questions, but to use individual items of measurement tailored to the specific context of EWEs. The latter was chosen with an acknowledgement that this is an ambitious approach that carries with it a risk of problems in validity and reliability but also with a view that it is a worthwhile compromise in order not to compromise breadth.

Attributions of Responsibility and Self-efficacy

Attributions of responsibility of and for the self and others have been identified as a factor that may or may not have an impact on engagement in preparedness behaviours, as have perceptions of the self in relation to others, which make up another element of place and community attachment. There is a wealth of theory on these themes within social psychology but for the current study it is deemed more useful to pose questions based on real world observations and return to the theory with more information as to narrow it down at this stage would be a huge task. The same is true of self-efficacy, but the

work of Bandura (1977, 1997) will provide a useful theoretical framework should this theme emerge strongly from the current study's data.

Trust

The question of trust has, again, a large body of literature within psychology. As a further attempt to move away from the constraints of studying risk perception in isolation as discussed earlier, a number of studies have recognised the importance of considering trust alongside it and found that perceptions are indeed influenced by trust (Siegrist & Cvetkovich, 2000; Siegrist et al., 2005). For the purposes of this study and as a result of the decision to take the focus away from risk perception in this study, there are two applied studies that are of particular relevance despite being conducted in a different context. Eiser et al (2007) and Eiser et al (2009) examined trust in authorities in relation to contaminated land and 'brownfield' sites within the UK. The first of these studies considered risk perception alongside trust and found that general levels of trust in the local authorities were low and that they were even lower in areas where people felt themselves to be more at risk. There was, however, a higher level of trust displayed in an area where the authorities had been more open and transparent in their communication of the risks. The main predictors of trust in the authorities were found to be a perceived willingness to communicate openly and a perception that they had the respondent's interests at heart.

Eiser at al (2009) looked at wider range of sources of information in relation also to contaminated land risk and found that scientists were trusted the most overall, due in part to their perceived levels of expertise, and developers the least due to their perceived motives. Friends and family were trusted fairly highly too despite low levels of expertise and this was due to perceived openness and shared interests, which were better predictors of overall trust than perceived expertise.

For the reasons discussed previously in terms of a trade-off between breadth and depth of theoretical content, the review of the trust literature has been confined to the above overview of applied and relevant studies in a

comparable context as a full review on the conceptual issues around trust is simply not possible here.

Decision-making

The one exception being made to the absence of using pre-existing scales in this study is the inclusion of a decision-making scale developed by Mann (1998). Cognitive decision making models are so numerous and complex as to be considered of little value here given the nature of the design, but the scale developed by Mann is a simple evidence based one that simply identifies a level of decision making confidence alongside a relative preference for four decision making styles; vigilance, buck passing, procrastination and hyper vigilance. The first of these is seen to be an 'adaptive' style in that it relates to a tendency to weigh up all of the available options, whilst the others could all be seen as 'maladaptive' as they are essentially all ways in which one can avoid making a definitive decision. This scale was developed out of a concern that most decision making theory did not take into account the fact that decisions are more often than not made in a context where a high emotional content is likely and where the consequences of decisions may be far reaching (Janis & Mann, 1977). For this reason, many of the theories that suggest that decision making is a 'rational' information processing task are suggested to be of limited value. This scale could provide a useful measure of individual differences in decision making style that may relate to other important themes in the hazard context.

Health Psychology

Health psychology studies, such as those of Weinstein mentioned earlier, have covered themes of risk related choices and behaviours in a broad range of applied contexts and some of the findings may be of use for later comparison for themes examined here. They are not, however, covered in any detail here because on the whole they are concerned with choices and behaviours in a

context where the risks are posed at an individual rather than a group or community level and where the nature and the source of the risks are scarcely comparable with the current subject matter. So, with the acknowledgement that these are of limited transferability due to individual context of health considerations compared with community context of weather events and climate change, they will be kept in mind when the data are analysed.

Attitude Theory

Already mentioned in the risk perception section, attitude research has over a number of decades sought to address questions around how people form beliefs about the world and how these beliefs in turn feed into behaviour, or indeed sometimes do not. Eagly & Chaiken (1993) proved to be a valuable resource in reviewing this body of work and evaluating how it may fit into the context of this study. Again, a full review of the theory is neither realistic nor appropriate at this stage, but an acknowledgement of the potential value of such a comprehensive body of work is useful here. In particular, the gap between attitudes and behaviour (e.g. Ajzen & Fishbein, 1980; Bentler & Speckart, 1989, Fishbein & Ajzen, 1992; McGuire, 1969) is one that has been repeatedly pointed out as a source of concern in disaster management. This study will seek first to identify the nature of attitudes and the discrepancies between these and behaviours, before returning to identify the most useful strands from within attitude theory.

The above themes relate largely to individual differences in attitudes, beliefs and motivations for engaging in proactive behaviour. It is also intended to include an exploration of cultural differences in how people adapt. For example, it may be that in more individualistic cultures (where individual identity plays a more central role in attitudes and behaviour than the group or community identity) there are both different behaviours and underlying motivations than in more collectivistic cultures due to the perceived differences of self in relation to others. For example, in an individualistic culture there may

be more emphasis in adapting on an individual and household level, rather than as a community.

Cross-cultural Research

Also of interest are cultural differences in mechanisms for predicting events and how they affect adaptation behaviour. The work of Rohrmann (2000) addresses this theme but is confined to the relationship between culture and risk perception only. Cultural differences in self-concept and community attachment have been discussed already. An example of other ways in which cultural differences may play a role in response the hazards is the way in which some cultures still employ traditional warning systems, such as observed changes in animal behaviour, water temperatures or cloud formations, which are passed down the generations within the communities, rather than relying on technological systems put in place by outsiders. Differences in warning system may have an impact on perceptions of locus of control and empowerment, and therefore influence motivation for engaging in proactive behaviour. In particular, traditional knowledge may be closely linked with religious and spiritual beliefs. This has been recognised in the social science research in volcanic risk context and a number of discussions have started to emerge on this theme. In particular, the interplay of religion and disasters has often been neglected in the research (Gaillard, 2010) and is now recognised as an essential factor in understanding responses to risk. A number of studies from other academic disciplines, particularly theology, have sought to address the issue of disaster and religion in developing countries across a range of hazard types (Dynes, 1965; Torry, 1986; Ali, 1992; Bankoff, 2004; Chester, 1998; Chester, 2005,) and some have also linked these issues with traditional knowledge and worldviews (Gaillard, 2006; Schlehe, 1996; Schlehe, 2008). From a psychological research point of view, it is worth noting that prevailing cultural values and beliefs are not necessarily taken on by all individuals in a given context and there may be many reasons why an individual does or does not buy into the value systems around him or her. These issues could include those of social identity,

conformity to group norms and self-concept. These again are issues that social psychology is well placed to explore.

Also mentioned earlier is the importance of considering the many implications of conducting research in a cross-cultural context. Throughout the introduction, reference has been made to the global nature of the problems faced in working in DRR. Many hurdles to developing effect DRR policies and practice exist on both developed and developing countries, and whilst there will undoubtedly be overlap, there will also be many issues that will be more closely related to the social, economic and political context in any given country. This both provides a strong justification for the need for cross-cultural research in the context of natural hazards if those working in DRR are to be able to distinguish between factors that may be culture specific and those that may be more generic responses to hazard and risk. With this, however, comes a clear need to consider cultural sensitivities around the collection of such data. Given that so many EWEs occur in less developed countries, the people who are to participate in research studies may have very different experiences and world views than those of the researcher, for example in the context of researching indigenous communities (Smith, 1999) and communities in developing countries (Connell, 2007). It is clearly of the greatest importance to consider the world views of participants before designing a study so that the concepts can be presented both in a way that is understood and more importantly in a way that is sensitive to important cultural beliefs. This and many other considerations are essential when planning cross-cultural research, such as definitions of concepts (which as we can seen in the risk perception research can be problematic enough within a single cultural framework), informed consent, entry into the field, approaches to data collection, ownership of data and dissemination of results (Marshall & Batten, 2003). Such issues must be addressed in terms of language, for example ensuring that meaning is not lost in translation, and this can be both a linguistic and a semantic issue when it relates to the wider issues of world view. A great deal of insight on this subject can be found within the literature on research for therapeutic interventions with Native American populations in the USA and Canada (Brandt-Castellano, 1986; Choney et al., 1995; Darou et al., 1993; Hudson & Taylor-Henly, 2001; Piquemal, 1983; Stubben, 2001).

Sometimes issues around cultural differences can become somewhat of a 'chicken and egg' debate in that the purpose of much cross-cultural research is in fact to identify world views and belief systems, so that to consider all of them in advance would be impossible. It is certainly possible, however, to ensure that a good initial knowledge of a culture in which a study is intended to be conducted is gained so that due respect can be offered to participants and cultural norms are not unnecessarily violated. More specific considerations, particularly around entry into the field, approaches to data collection and dissemination of results will be discussed later when individual study locations are presented and discussed, as well as in the individual study chapters.

This section has provided an overview of the applied research conducted by psychologists and a brief introduction and discussion of the theoretical areas deemed to have the most potential for future application in this field of enquiry. There is clearly immense scope for new psychological research to help to understand better the processes underlying people's choices and behaviours in the context of living with the risk of extreme events in the natural environment. The relationship between human beings and the natural environment on which we depend is a unique and extremely important one.

So, in compiling the final research ideas for the questionnaire, most of the ideas evolved originally out of conversations with people living in hazardous areas and those who already had direct experience of an extreme weather event. Such anecdotal material complemented the literature and information given by experts and helped to ensure a set of themes that reflected the reality of the complexity of human-natural hazard interactions and further highlighted how many aspects are still so little understood.

In summary, for each of the themes identified from the information gathering phase there are either studies that have addressed the theme in an applied setting other than this one but sufficiently similar to be worthy of comparison, or there are bodies of pre-existing theory that are too broad to relate at this stage but which may provide a useful context to return to once the data has been collected and analysed.

Based on all of the information presented and discussed so far it is necessary as a next step to take the themes identified as providing valuable insight into some of the gaps in current understanding and develop them into more specific research questions. These will then be developed into a questionnaire survey to be carried out in cross-hazard and cross-cultural settings to attempt to paint as full a picture as possible in each thematic area chosen. The goal of the study is to explore these key questions and themes in an applied context in order to provide a foundation for the development of applied social psychology research in the context of natural hazard risk reduction. This will serve, at this exploratory stage, to provide descriptive information on each theme, to explore initial relationships between selected themes and to identify key areas for development into future and more in depth studies.

Research Questions

The vast amount of information so far presented and discussed leads us to a number of more specific research questions about psychological factors in response to EWEs. The questions are as follows:

1. What is the role of prior experience in how people feel about and react to EWEs?
2. What are people's attitudes towards and beliefs about EWEs and the way in which they are managed?
3. To what extent do people trust various entities responsible for risk management?
4. To what extent do people feel responsible for protecting themselves and others from the effects of EWEs and how does this relate to other variables?

5. To what extent do people feel able to protect themselves and others from the effects of EWEs and how does this relate to other variables?
6. Is there a difference in levels of attachment to people and place between different cultures and if so, how does this relate to attitudes and response in the context of EWEs?
7. What are the levels of reported engagement in preparedness behaviours and how does this relate to other factors?
8. What are people's attitudes towards climate change and to the wider natural environment? Also, their perceived relationship, if any, to EWEs?
9. What are the most prevalent decision-making styles and how does this relate to other factors?
10. Are there demographic differences in areas such as gender, employment and home ownership across the above questions?
11. Are there cultural differences between at-risk populations in different countries?
12. Are there differences across different hazard types?

These questions cover all of the thematic areas discussed so far. A questionnaire survey was chosen for the study design in order to maximise the amount of data collected across the selected study locations. In order to encompass both a cross-hazard and cross-cultural element to the study, locations were chosen in flood risk areas in the UK and hurricane risk areas in Belize, Central America. It was decided to confine the research to one hazard type, namely EWEs (as opposed to geo-physical events such as earthquakes and volcanoes) but to include a cross-hazard element by conducting studies in locations with different types of EWEs. Belize is a middle income country in Central America and was chosen for a number of reasons that are presented in depth at the start of the Belize study. It was a British colony until the 1980s and as a result has a comparable style of government and many areas of overlap in cultural influence, not least the prevalence of Christianity as the main religious practice. Clearly as a nation surrounded by developing countries, in a drastically different climate and with a completely different ethnic mix than the UK, there will be a large number of cultural differences. It was, however, deemed to be

sufficiently connected historically and religiously as well an in language, so as not to present the most significant problems posed by working in developing countries and with more traditional indigenous communities. The study design must clearly take into account a consideration of the differences apparent in advance and other differences are of the course central to the purpose of a cross-cultural design. A fuller discussion of issues relating to the Belize study is presented in the Belize study and cultural comparison chapters.

The next step is to take the themes and develop them into statements and items suitable for use in a questionnaire survey suitable for the selected study locations.

Questionnaire Development

The questionnaire survey was designed and built from the questions presented above, to include themes intended to capture the some of the main gaps in understanding of human attitudes, perceptions and behaviours in the context of EWEs. The full texts of the pilot questionnaire and the final version used in subsequent studies can be found in Appendices 1 and 2.

As discussed in the introduction, to use scales developed in other contexts for each of the thematic areas chosen would have been impractical. In addition to this, a certain level of adaptation would have been needed for the specific context in many cases. For this reason, with the exception of the decision-making scales, items were designed and written specifically for this study, but with previously discussed theoretical areas in mind for use in later studies designed from the current findings.

The items in the questionnaire were designed and compiled to address the research questions as follows:

1. *What is the role of prior experience in how people feel about and react to EWEs?*

   In order to explore the role of prior experience, it is important to gather data on the actual experiences that the participants have had of EWEs. This was covered by asking about both the type of hazard experienced and the various ways in which the event impacted on them, their friends and their family. The list of event types was not exhaustive, but rather was based on the events that constitute the main risk in each of the geographical areas chosen for data collection. One of the main themes emerging as important for new research is the impact of prior experience on attitudes, perceptions and behaviours. It is important not

just to explore whether prior experience does or not impact on subsequent attitudes, perceptions and behaviours, but how.

2. *What are people's attitudes towards and beliefs about EWEs and the way in which they are managed?*

The sections are then organised into sets of statements designed to cover attitudes and perceptions about the issues chosen for exploration. The first of these sections covers attitudes and perceptions about the incidence of EWEs; their frequency, severity, predictability and opinions about their management and also perceptions of personal risk and feelings of fear. These items are designed both for descriptive information about the sample and for an exploration of relationships with other items and sections. The theme of perceived obligation towards risk reduction behaviour is also covered to compare with related attitudes and with actual engagement in preparedness behaviours. A short section on relative risk taken from other risk perception and attitude studies is also included for both the reasons given above and for potential comparison with other related studies, not about EWEs, but about environmental attitudes and perceptions.

3. *To what extent do people trust the various entities responsible for risk management in relation to EWEs?*

Trust measures were designed to cover a range of relevant 'agents' usually involved in the management of risks in relation to EWEs. These items were designed to obtain data both across 'agents' and across different aspects of trust in order to further examine the distinct elements of which trust consists.

4. *To what extent do people feel responsible for protecting themselves and others from the effects of EWEs and how does this relate to other variables?*

This theme is covered together with self-efficacy and explained below.

5. *To what extent do people feel able to protect themselves and others from the effects of EWEs and how does this relate to other variables?*

This section covers both responsibility for the protection of self, others and property in relation to EWEs and alongside this, feelings of self-efficacy in carrying out such protective action. Items were intentionally worded exactly the same with only a difference in responsibility and ability.

6. *Is there a difference in levels of attachment to people and place between different cultures and if so, how does this relate to attitudes and response in the context of EWEs?*

Items in this section were designed to avoid issues around definition as discussed in the introduction. They are therefore written to address both feelings of attachment to home and place so that they can be examined in relation to each other and other items.

7. *What are the levels of reported engagement in preparedness behaviours and how does this relate to other factors?*

Reported engagement with a number of possible preparedness behaviours were included, along with an importance

rating for each of the behaviours for comparison. The latter was included to examine potential difference between attitude and behaviour as well as with cultural difference in mind.

8. *What are people's attitudes towards climate change and to the wider natural environment. Also, their perceived relationship, if any, to EWEs?*

Moving from specific EWEs to more general issues regarding the environment, a section is included to gather information about attitudes towards climate change and towards relationships with the natural environment as a whole. This topic has been identified as covering issues that are usually researched entirely separately from the work on natural hazards and yet may be valuable as an aspect of the same field. Firstly items were added to measure the perceived degree to which climate change is happening at all, then, to link climate change to EWEs. Items were included to measure attributions of the role of climate change towards specific recent EWEs. This is both to examine any perceived link between climate change and EWEs and also to check for effects of proximity to the participants by adding one event that occurred close to each study location.

9. *What are the most prevalent decision-making styles and how does this relate to other factors?*

The Melbourne Decision-making scale (Mann, 1998) was used for this section.

10. *Are there demographic differences in areas such as gender, employment and home ownership across the above questions?*

Measures were taken of a range of demographic factors; age, gender, employment, home ownership and ethnic background.

11. *Are there cultural differences between at-risk populations in different countries?*

This question is not examined in particular items, but rather as a cross-cutting theme at the data analysis stage across all items in the survey.

12. *Are there differences across different hazard types?*

As for cultural difference, this question was designed as a cross-cutting theme.

For each of the themes described above, a number of specific items were developed for use with a variety of scales. A full copy of both the pilot questionnaire and the final version are available in the appendices. A summary of each of the sections is provided below. All items were coded numerically but a number of different scales were used and coding differed accordingly. Information on how each scale was coded is provided below and repeated in appropriate sections of the results for clarity.

Section 1: "Tell us what you think about the risk of extreme weather events".

Participants are asked, using a 5 point Likert scale (-2 = strongly disagree, -1 = disagree, 0 = neither agree nor disagree, 1 = agree, 2 = strongly agree), to rate to what extent they agree with a range of statements regarding the predictability and frequency of extreme weather, and about the degree to which they believe

that such events can be prepared for. Statements also include measures of self-efficacy and responsibility, and perceptions of risk.

Section 2: "Tell us about your community".

This section contains straightforward questions about the community in which they live, and also about the degree to which they identify with their community. A range of different scales were used and coding is explained where necessary during presentation of results.

Section 3: "Tell us about your actions regarding extreme weather events".

Measures here seek to examine the relationship between the actions that participants deem important in preparing for extreme weather events and also those in which they currently engage. Actions were coded as 0 for 'no' and 1 for 'yes' whilst importance ratings were coded 0 = not at all, 1 = a little, 2 = somewhat and 3 = extremely.

Section 4: "Tell us what you think about climate change".

Broadening the focus from extreme weather events that pose a specific risk to each of the regions in which the survey was conducted, this section asks more general questions about attitudes towards climate change, how it may best be managed and by whom. Attitudes statements are again coded from -2 for 'strongly disagree to 2 for strongly agree.

Section 5: "Tell us about how you make decisions".

An existing model of decision making style (Mann et al. 1998) has been included here in order to offer the possibility of discovering any relationships between personal decision making style and the responses in the rest of the survey. Items in this scale are coded as 0 = 'not true for me', 1 = 'sometimes true for me' and 2 = 'true for me'.

Section 6: Demographic features, including age, sex, number of children, whether they are home owners, whether they have home insurance, employment status, religion and ethnic background.

This section was included to assess the demographic makeup, and possible distinguishing characteristics of the sample.

A pilot version of the survey was used for data collection in the Florida Keys, which are in a geographical area of high hurricane risk and therefore have a population who are experienced in and familiar with the risks and impacts associated with EWEs. The study was conducted solely for the purpose of questionnaire development and to gain further insight into some of the issues common to areas at risk from EWEs around the world.

Background

The Florida Keys have been hit repeatedly by hurricanes in recent years. Stretching as they do out into the Gulf of Mexico, they lie in one of the most frequent paths taken by Atlantic hurricanes. As a result, residents of the Keys have a wide range of hurricane experience whether they have stayed to ride out the storms or followed the well planned evacuation routes onto the Florida mainland. The time of the study fell right at the end of the hurricane season, this time during which no major hurricanes made landfall in this area, but ensuring that themes covered would have high salience and recency for the residents.

Method

Participants

The majority of the sample was recruited on a trailer park on Cudjoe Key, in which residents are a combination of those with vacation properties and those who have opted to move there permanently for retirement. The remainder of the participants were recruited around workplaces at the local mall on a random basis. A total of 60 questionnaires were distributed, of which 51 were completed and returned. The sample consisted of 22 male and 29 female

participants between the ages of 23 and 89. All of the participants were American citizens, with the exception of two UK citizens who own property on the Keys.

Results

Descriptive Statistics

84% of the respondents were homeowners and 75% possessed household insurance. 31% of them are retired, whilst 35% are employed full time and 20% self-employed. The remainder were either employed part time or considered themselves to be 'homemakers'.

Prior experience of extreme weather events was reported as follows. 92% of the sample report having been affected in some way by hurricanes or windstorms and 65% by flooding. Of these people, none had suffered personal injury, but 24% reported that they had experienced personal danger. 82% reported damage to their property and 28% to their workplace. 47% experienced disruption to their work, business or education as a result of an extreme weather event, 39% to their transport and travel and 84% lost services such as electricity and water. 77% said that family members had also been affected, with again no reports of personal injury. 69% said that family had experienced property damage, and 59% loss of services.

Following the pilot study a number of alternations were made to the questionnaire based in a combination of participant comments and new learning from analysis of the Florida data. The details of these amendments are provided below.

- Added evacuation from property to prior experience list (oversight in Florida pilot)
- 1.1.7 – removed word "vulnerable" following advice from John Twigg on the ambiguity of the term
- Removed 1.1.13 – "I think as much as possible should be done to protect people from extreme weather events when they occur" – because everyone agreed!
- As above for 1.1.14 "I think that as much as possible should be done to minimise economic losses when extreme weather events occur" and 1.1.15 "I think that as much as possible should be done to minimise social disruption (e.g. evacuation, relocation) when EWEs occur". Was supposed to be getting at priorities but instead people agreed with all as there was no 'forced choice' element.
- 1.2s – changed 'can' and 'should' to 'am responsible' and 'am able' as this reduces ambiguity but remains open to some degree of interpretation by the respondent.
- 1.3s – added "I don't see the point in taking action unless I know exactly what the risks are" to attempt to tap into possible inaction through uncertainty/ambiguity.
- 1.10 – added "How much do you think that the following have the capacity to manage the risks of extreme weather events" – to get at a different element of the trust issue e.g. lack of success could be seen as resource driven rather than lack of trust in intentions, if it came out as different.
- 2.4 – "How many members of the community do you regard as personal friends" - added the word 'approximately' and asked for an actual number due to ambiguous responses such as 'all'.
- Added new set of statements to community section to attempt to draw out place attachment and property/people/safety priority issues. (2.6s).
- Added 2.7 – Rating items in order of the distress they would cause. Attempting to get at relative priorities such as economic loss compared to disruption, property damage, injury etc – to replace removed items 1.1.13 – 1.1.15.
- 3.1 – Removed the response option 'none of the above' as it was obvious if they didn't select any of the others!

- Added 3.4 – "After an extreme weather event, whom would you turn to first for help?" More information on trust.
- 4.2.4 – Removed hurricane Dean in Aug 07 and added tornadoes in Tennessee in Jan 08.
- 4.3s – Climate change attitudes: added 4.3.5 "There's no point in doing anything about climate change until we know the facts for certain" To get at ambiguity/uncertainty issues as for 1.3s relating to EWEs.
- Removed 4.3.7 "Climate change must be addressed through the development of new technology" and 4.3.8 "Climate change must be addressed through every individual changing their lifestyle" and added a table with options to choose from, which put lifestyle change against new technology and asks which is more important or whether they are equal.
- Added "I would prefer not to change my lifestyle if other methods can be found to deal with climate change"
- Changed 2 statements (4.3.9 and 4.3.10) to one "It's the job of leaders, not ordinary people like us to do something about climate change"
- Added table about responsibility for dealing with climate change, requiring allocation of points and therefore relative importance to the individual (4.3.11)
- Removed "I believe that human beings are entitled to use the natural world for our own benefit" as too similar to "I believe that the natural world is a resource for the use of human beings" Word 'resource' seemed neater and fitted with common language used.
- Added 4.3.14 – "I believe that human beings are more important than other species". Relative priorities again.
- Demographics – added questions about having children and how old, gave lists for religion and ethnic origin due to some of the crazy answers given in the Florida sample when no categories were given to choose from.

The finalised questionnaire was then reworded where applicable in order to be appropriate for UK participants. The intention before the pilot study was to use the comments from participants and the data analysis to focus on a smaller number of themes in more depth in the main study. This phase was underway in early summer of 2007 when the flooding in Yorkshire

occurred. It was decided that this would be a good opportunity for a study in a location with recent EWE experience in areas that were demographically diverse and across two very different cities and surrounding areas. For this reason, amendments were left as above and the study was carried out with all of the selected themes still included.

Chapter Three

Study One – UK Flood Risk Part I: Yorkshire, UK

Background

In June and July 2007 uncharacteristically heavy and sustained rains fell on the North and the South West of England and in many locations drainage systems and waterways were unable to contain the deluge. It was the wettest summer since records began in 1766, with a total of 395.1mm falling in May, June and July (Pitt, 2008), which was well over double the usual levels. This was caused by a combination of the position of the polar jet stream and high North Atlantic sea surface temperatures. As a result, populated areas across Yorkshire, Gloucestershire and the Thames Valley experienced the heaviest flooding in decades; 55,000 properties were flooded, of which 48,000 were households and 7,300 were businesses. Thirteen people died, around 7,000 people were rescued from the floodwaters by emergency services and almost 500,000 were without water or electricity (Pitt, 2008). Many businesses were also damaged and forced to close, and a large dam close to a populated area was at high risk of bursting for several days following the rains. In a government review conducted in the aftermath of the floods, the events were described as "...the country's largest peacetime emergency since World War II." (Pitt, 2008, p.vii).

To put the floods into an international context, there were over 200 floods worldwide during 2007, affecting 180 million people and causing over 8,000 deaths and over £40 billion worth of damage. Yet the UK floods were classed as the most expensive in the world in 2007 (Pitt, 2008).

The current study was carried out in two locations in Yorkshire that were affected by the floods of the summer of 2007.

Method

Participants

A total of 143 participants completed the survey questionnaire out of 300 distributed, giving a response rate of just under 50%. Samples were drawn from five residential locations in Yorkshire where flooding and related damage was reported in July 2007. The first three locations were villages outside of Sheffield, South Yorkshire, all of which were affected in slightly different ways by the flooding. Catcliffe was inundated by floodwaters, whilst Whiston was on high alert for possible flooding and Treeton was placed on high alert due to the possibility of a nearby dam bursting its banks. All three locations are small semi-rural communities, but differ considerably in wealth and history. Treeton and Catcliffe are both former mining communities with histories closely tied with the rise and fall of the coal industry. The decline of the industry during the 1980s led to widespread unemployment and associated socio-economic issues and in many respects these communities have never regenerated to their former levels of prosperity. Many properties are council estates built especially for low income families and those on government income support. Whiston, by contrast, is largely a wealthy commuter village serving the nearby town of Rotherham and city of Sheffield. Properties are generally much higher value, as are average incomes and associated lifestyles.

The remaining two locations were in the city of Hull on the East coast of Yorkshire. The city's population was recorded as 253,400 in the 2001 census and has more recently (July 2004) been re-estimated at approximately 248,000. It has exposure to a different set of environmental concerns in that its location on a sea estuary puts it at threat not only from intra-urban flooding due to poor drainage and swollen rivers, but also to coastal erosion and potential sea level rise. Participants were recruited from two contrasting urban neighbourhoods affected by the flooding. The first, a working class area of council estates not far from the city centre was extensively flooded and at the time of data collection many houses remained uninhabitable. This clearly introduces a possible sample

bias which needs to be recognised and taken into account in that the timing of the study excluded those affected the most as they were still unable to reoccupy their properties. This was not an issue in the South Yorkshire samples as damage was far less severe and relocation beyond evacuation at the time of the flooding had not been necessary. Kingswood is a new-build suburban estate on a flood plain next to a canal, which was also flooded at the same time but was not displaying so many obvious signs of impact by the time data collection took place and there were no obvious signs of properties remaining vacant at the time of data collection.

The ethical issues connected with collecting data in an area at risk from an EWE had been considered carefully in the study design phase and this became even more important when it was decided that data would be collected so soon after an event of such magnitude had occurred. The brief at the start of the questionnaire survey was worded carefully so that participants were completely clear that their participation was voluntary at every stage and withdrawal at any time would have no consequences. This was reinforced verbally at the time of handing out the questionnaires. Ethical approval for the study was gained through the departmental ethics committee.

Procedure

Participants were recruited in residential areas using a door-to-door method. Streets were selected on the basis of exposure to recent flooding by checking records of exposure to the various impacts of the recent floodwaters. Every house on the selected streets was approached and a record was kept of those properties that were empty at the time of calling, those who answered the door but declined to participate and those who both answered the door and agreed to complete the survey. This was both to ensure that all questionnaires could be collected efficiently and to ensure that no person who declined to participate would be inadvertently approached a second time. Once the door was answered by any adult occupant, the purpose and requirements of the study were explained verbally by the researcher, or a trained assistant, and

consent was obtained verbally at the end of this introduction. Questionnaires were then left with participants for a minimum of a 24 hour time period, with a specific collection time negotiated on an individual basis. If participants were not at home at the arranged time, or had not completed the questionnaire as agreed, a pre-paid envelope was left in order that it may be posted on at the participants' convenience.

Questionnaire

The questionnaire used was as described in the questionnaire development section above. A summary of the main themes is provided here as a reminder.

Section 1: "Tell us what you think about the risk of extreme weather events".

Participants are asked, using a 5 point Likert scale, to rate to what extent they agree with a range of statements regarding the predictability and frequency of extreme weather, and about the degree to which they believe that such events can be prepared for. Statements also include measures of self-efficacy and responsibility, and perceptions of risk.

Section 2: "Tell us about your community".

This section contains straightforward questions about the community in which they live, and also about the degree to which they identify with their community.

Section 3: "Tell us about your actions regarding extreme weather events".

Measures here seek to examine the relationship between the actions that participants deem important in preparing for extreme weather events and also those in which they currently engage.

Section 4: "Tell us what you think about climate change".

Broadening the focus from extreme weather events that pose a specific risk to each of the regions in which the survey was conducted, this section asks more general questions about attitudes towards climate change, how it may best be managed and by whom.

Section 5: "Tell us about how you make decisions".

An existing model of decision making style (Mann et al. 1998) has been included here in order to offer the possibility of discovering any relationships between personal decision making style and the responses in the rest of the survey.

Section 6: Demographic features, including age, sex, number of children, whether they are home owners, whether they have home insurance, employment status, religion and ethnic background.

This section was included to assess the demographic makeup, and possible distinguishing characteristics of the sample.

Results

Descriptive Statistics

Of the 143 questionnaires completed and returned, 77 (54%) were from Hull and 66 (46%) percent from the three villages near Sheffield. Seventy four (52%) were female, 67 (47%) male and 2 did not specify gender. 94% identified themselves as "White British", 77% as Christian (the remainder identified themselves as atheist, agnostic, Buddhist or Muslim). 76% were homeowners, 83% possess home insurance (specifically for flood damage) and 75% have children. Fifty six percent of the sample was employed full or part time, 20% were retired, 6% self-employed, 5% unemployed, 9% identified themselves as homemakers and 1% in education. The remainder selected the response 'other'.

In the planning phase of the study, the locations chosen for this sample were selected on the basis of flood risk rather than actual flood experience. The idea was to gather data from a range of locations at similar levels of risk, but with a varied range of demographic characteristics; for example urban and rural, higher and lower income. Also, the intention was to select areas at high risk of flooding, but for different reasons. For example, inland where the main risk is posed by a combination of heavy rainfall and poor drainage and coastal areas where the main risk comes from rising sea levels. In addition, rivers bursting their banks can affect both of these types of location. During the planning phase, however, the floods of July 2007 occurred and presented locations with immediate experience of flooding and related hazards both on the coast and inland. The locations were therefore chosen to cover the range of criteria outlined above, and in addition to target communities with prior experience of various types. For example, Catcliffe was flooded quite extensively, whilst Treeton was flooded in parts but also put on high alert because of the risk of a nearby damn bursting which caused people to be evacuated and for roads to be closed.

The original idea was to split the sample by location in order to group the participants by type of experience but on initial examination of the prior experience descriptive by region it was apparent that this was not going to be the most effective method. For example, the two locations in Hull were chosen because one was an inner city location that had been hit hard by the flooding whilst the other was a newly built suburban estate next to a river and considered to be at high risk, but had reportedly not been badly affected in the flooding of that summer. The timing of the data collection meant, however, that in the location affected by the flooding that year many families were still unable to return to their properties and therefore the participants were largely from properties that had not been badly affected. In that neighbourhood only 26% reported having been affected by flooding. By contrast, 84% of the households living in the high risk but supposedly not so badly affected neighbourhood reported experience of flooding. This could be down to a number of possible reasons, such as that many of the households in the part of the estate nearer the river, who had been flooded when the river burst its banks, completed the

survey whilst others in the less affected parts did not. Conclusions of this kind cannot however be drawn from the available data.

Based on this finding, it was decided that it would be more useful to look the entire UK sample (including the three Sheffield locations) and examine the range of actual personal experience as reported by participants, rather than rely on assumed incidence of flooding in the broad locations selected, as this had turned out not to be straightforward.

Reported experience of flooding.

Of the full sample, 73 (77%) reported having been affected by flooding in some way. When asked how they had been affected by flooding, these 73 respondents described their experience in terms of the categories shown in Table 3.1.

How affected	**%**
Personal injury	1
Perceived personal danger	8
Damage to property	48
Evacuation	55
Damage to workplace	4
Disruption to work	24
Disruption to transport/travel	34
Loss of services	17

Table 3.1 Reported experience of flooding by type

In this event property damage and evacuation clearly affected the sample the most, with disruption to transport and travel and disruption to work also having a relatively high impact. Loss of services affected almost one fifth of the participants, but a major electrical substation was closed down for a period of time close to one of the communities in the sample due to the possibility of a nearby damn bursting, so this may have biased the statistics for this item.

Following an examination of this breakdown by type of experience, the data were reduced into a variable named 'anyaff' in order to give a count of the total number of impacts experienced by each participant, of any kind. This computed variable ranged from 0 to 6 around a mean of 1.80 (SD = 1.51). Since 32 (22%) of the total sample reported no impact and a further 38 (27%) just one impact, it was decided to split the sample at the median into the 49% reporting one or fewer impacts overall and the 51% experiencing more than one. The new group variable was named 'affgp' and the two groups were then labelled 'less affected' and 'more affected'.

There was a slightly higher proportion of women in the less affected than more affected group (52% vs 43%) but this difference was non-significant (Chi^2 = 1.18, ns). This meant that affgp and gender could be used as independent variables in a series of multivariate and univariate analyses.

The different sections of the questionnaire were then submitted to a series of 2 x 2 (gender x affgp) MANOVAs and ANOVAs. Tests for homogeneity of variance proved satisfactory in almost all cases. Furthermore, all main effects reported as significant in these analyses were confirmed as significant by Mann-Whitney tests, indicating that it is safe to rely on these parametric statistics as indicators of the reliability of group differences. The results of these analyses are presented below by theme, starting with an outline of descriptive statistics for each theme.

(Items 1.1.1 to 1.1.12)

Seventy-seven percent of respondents agreed or strongly agreed that extreme weather events are becoming more severe. The same number also agreed that they have become more frequent over the past 10 years and 69% believe that they will become more frequent over the next 10 years. Fifty-five percent believe that they are becoming more difficult to predict. All of the above showed correlations between .37 and .79 and all were significant at the <.01 level.

In terms of impact on people, 44% believe that the people who suffer most in an extreme weather event are the poor. Forty-one percent disagree or strongly disagree and only 15% neither agree nor disagree. When the same statement was presented but 'the poor' was replaced with "those who have done the least to protect themselves", the weightings were somewhat different; only 16% agreed or strongly agreed, whilst 55% disagreed or strongly disagreed and 30% gave no opinion either way.

A 2 x 2 (gender x affgp) MANOVA was run on the belief and perception items (q1.1.1 – 1.1.12). This showed significant main effects for both gender (multivariate $F(12,115) = 3.04$, $p<.001$, $eta^2 = .24$) and affgp (multivariate $F(12,115) = 2.08$, $p<.05$, $eta^2 = .18$). The gender x affgp interaction was non-significant. The means are presented in Table 3.2.

Item Number	Key Words	Less Affected		More Affected	
		Male	Female	Male	Female
1.1.1	More severe	.55	1.16	1.00	1.14
1.1.2	More frequent in past	.39	1.26	1.03	1.11
1.1.3	More frequent future	.33	1.03	1.07	1.00
1.1.4	Difficult to predict	.33	.71	.58	.43
1.1.5	Nothing to be done	.15	.23	.13	-.20
1.1.6	Plenty can be done	.76	.71	.68	.91
1.1.7	People who suffer are poor	.24	.32	-.07	-.06
1.1.8	People who suffer are least protected	-.24	-.23	-.61	-.66
1.1.9	Personal risk	-.09	.29	.39	.29
1.1.10	Feeling of fear	-.15	.52	.03	.34
1.1.11	Prefer not to think	-.24	.48	-.52	-.03
1.1.12	Should be prevented	.49	.94	.58	.86

Table 3.2 Perception and belief item means for gender and prior experience

(Items coded as follows: -2=strongly disagree, -1=disagree, 0=neither agree nor disagree, 1=agree, 2=strongly agree)

Univariate tests revealed that the gender differences were on items 1.1.1 ($F(1, 126)=7.29$, $p<.01$, $eta^2=.06$), 1.1.2 ($F(1, 126)=11.38$, $p=.001$, $eta^2=.08$), 1.1.3 ($F(1,126)=6.21$, $p<.05$, $eta^2=.05$), 1.1.10 ($F(1,126)=7.83$, $p<.01$, $eta^2=.06$), 1.1.11 ($F(1,126)=17.39$, $p<.001$, $eta^2=.12$) and 1.1.12 ($F(1,126$, $p<.05$, $eta^2=.04$). In other words, females were more likely to believe that EWEs are becoming more severe and have become more frequent, that they are likely to become more frequent, feel more frightened at the thought of EWEs, prefer not

to think about them and think that they should be as far as possible prevented from happening in the first place.

With respect to prior experience (affgp), there were significant univariate differences on items 1.1.3 ($F(1,126)=7.54$, $p<.01$, $eta^2=.06$), 1.1.8 ($F(1,126)=6.93$, $p<.01$, $eta^2=.05$) and 1.1.11 ($F(1,126)=7.30$, $p<.01$, $eta^2=.06$). Those more affected were more likely to believe that EWEs will become more frequent, less likely to believe that when natural disasters happen the people who suffer the most are usually those who have done the least to protect themselves and less likely to say that they prefer not to think about EWEs.

Perceived personal responsibility for self, property and others

(Items 1.2.1, 1.2.3, 1.2.5, 1.2.7)

When asked about the level of personal responsibility felt towards their own personal safety, the protection of their property and of others, 44% of respondents either agreed or strongly agreed that they felt responsible for the safety of themselves and their family, whilst 32% neither agreed nor disagreed and 24% disagreed or strongly disagreed. With regard to their property, agreement and strong agreement was 39%, with 35% offering no opinion either way and 26% agreeing or strongly disagreeing. Only 23% felt responsible for others, with 42% disagreeing and the lowest agreement was 12% for responsibility for protecting others' property. In this final category, 61% disagreed or strongly disagreed.

Items relating to the level of responsibility felt with regard to taking action to protect self and others were submitted to a 2 x 2 MANOVA. This analysis showed no significant multivariate effects of gender ($p=.54$), prior experience ($p=.70$) or their interaction ($p=.43$). Significant differences were found between the mean scores for the responsibility items for the same subjects as a whole ($p<.001$). Means are presented in Table 3.3.

Item	Key words	Mean	N
1.2.1	For self and family	.22	139
1.2.3	For property	.10	139
1.2.5	For neighbours	-.22	139
1.2.7	For neighbours' property	-.54	139

Table 3.3 Mean scores for perceived responsibility items

(Items coded as follows: -2=strongly disagree, -1=disagree, 0=neither agree nor disagree, 1=agree, 2=strongly agree)

Perceived personal ability to protect self, property and others

(Items 1.2.2, 1.2.4, 1.2.6, 1.2.8)

In contrast to the perceived responsibility measured in the previous section, the following were items designed to measure perceived ability in relation to the same themes. They are reported relative to the above measures of responsibility.

Despite agreement or strong agreement from 44% of respondents in feeling responsible for protecting themselves and their families from EWEs, only 13% reported agreement or strong agreement with feeling able to do so. 45% disagreed or strongly disagreed with feeling able to do so. Equally only 13% felt able to protect their property, compared with 39% feeling responsible for doing so and 52% reported feeling unable to protect their property.

For items on perceived ability for taking action to protect self and others, again no significant effects were found in a 2 x 2 MANOVA of gender ($p=.86$), prior experience ($p=.97$) and their interaction ($p=.50$). Significant differences were found between the mean scores for the responsibility items for the same subjects as a whole ($p<.005$). Means are presented in Table 3.4.

Item	Key words	Mean	N
1.2.2	For self and family	-.38	136
1.2.4	For property	-.48	136
1.2.6	For neighbours	-.21	136
1.2.8	For neighbours' property	-.35	136

Table 3.4 Mean scores for perceived ability items

(Items coded as follows: -2=strongly disagree, -1=disagree, 0=neither agree nor disagree, 1=agree, 2=strongly agree)

Correlations between responsibility and ability items showed that people felt more able if they felt more responsible. For items 1.2.1 with 1.2.2 (perceived responsibility and ability to protect self and family) r=.37, df=141, p<.001; items 1.2.3 with 1.2.4 (perceived responsibility and ability to protect own property) r=.55, df=142 p<.001; items 1.2.5 and 1.2.6 (responsibility and ability to help neighbours to protect themselves) r=.49, df=141, p<.001) and items 1.2.7 and 1.2.8 (responsibility and ability to help neighbours protect their property) r=.55, df=137, p<.001.

Perceived responsibility of others

(Items 1.3.1 to 1.3.5).

Agreement and strong agreement with the statement "The best way we can help ourselves is by helping each other" was 75% and only 8% disagreed.

Fifty-nine percent disagreed or strongly disagreed that there is little point in them doing anything to protect their local environment if others aren't doing the same, and only 18% agreed or strongly agreed. Similarly, 67% disagreed that they shouldn't have to take action if others aren't doing the same. When it came to action under uncertainty, 49% disagreed or strongly disagreed that

there is no point in taking action unless they know exactly what the risks are, whilst only 29% agreed or strongly agreed. The remainder did not agree or disagree.

A 2 x 2 MANOVA to look for effects of gender and affgp again showed no significant multivariate effects of gender (p=.36), affgp (p=.41) or their interaction (p=.23).

Relative risk

(Items 1.4 to 1.6)

Respondents were also asked to rate their perceived risk of extreme weather events as relative to their own and other geographical areas, on a global to a local scale.

In these ratings of relative risk, 37% believe that their own country is at about the same risk as other countries, whilst 51% believe it to be a little or a lot less at risk and 12% say it is a little or a lot more at risk. In terms of their own region within the country compared to other regions, 56% rate risk as about the same, 14% as more so and 30% as about the same. On a very local level, 50% believe that there home is about the same risk as others in the neighbourhood, 22% believe it is at more risk and 28% at less.

A 2 x 2 MANOVA to look for effects of gender and affgp again showed no significant multivariate effects of gender (p=.30), affgp (p=.26), affgp or their interaction (p=.49).

Trust

(Items 1.7 to 1.10)

Participants were asked to respond to a number of statements about trust in others with respect to dealing with extreme weather events.

For the first statement relating to trust in giving accurate information regarding the risk of extreme weather events, 63% said that they would trust the national government either a little or not at all whilst 36% answered a moderate amount or very much. For local government, 67% said little or not at all and 33% said a moderate amount or very much. In contrast, 67% trusted scientists either moderately or very much in giving them accurate information and the media 43%. Friends and family were rated higher than the media at 48%. Interestingly, "local community figures" were trusted the least at 75% trusting them a little or not at all.

When asked how much the same set of people or entities are believed to know about the risks of EWEs, 60% thought that the national government knows either a moderate amount or very much, but rated the local government more evenly, with 51% believing it to know little or nothing at all and 49% a moderate amount or very much. Scientists were rated the most highly for this statement, with 82% deciding that they know a moderate amount to very much. "Local community figures" did not fare well again, as 64% believe that they know little or nothing. The media was afforded an almost even split with 52% reporting that they know little or nothing, and family and friends scored the lowest on this measure with 73% believing them to know little or nothing.

The next measure addressed how much the same people and entities are believed to have respondents' interests at heart. Seventy percent believe that the national government have their interests at heart only a little or not at all and this figure is 61% when it comes to local government. Scientists were split more evenly this time, with only 53% believing that they have peoples' interests at heart

Finally, participants were asked to what extent these same individuals and groups have the capacity to manage EWEs. Responses to this item were far more evenly balanced than for previous items in the set on the first three groups; national government, local government and scientists. Local community figures were rated by 68% of respondents as having little or no capacity to manage such events. The media were rated as having little or no capacity by 78%, and friends and family by 83%. Percentages and means for these items are shown in Tables 3.5 to 3.10 for each agent. Items were coded in this section as follows: 0=not at all, 1=a little, 2=somewhat, 3=very much.

National Government:

	% Not at all	% A little	% Somewhat	% Very much	Mean	N
Trust in giving information	28.5	35.0	32.8	3.6	1.12	137
Knowledge	12.6	27.4	40.0	20.0	1.67	135
Having interests at heart	37.3	32.8	26.9	3.0	.96	134
Capacity to manage risk	17.0	30.4	24.4	28.1	1.64	135

Table 3.5 Percentages and mean scores for national government on trust items

Local Government:

	% Not at all	% A little	% Somewhat	% Very much	Mean	N
Trust in giving information	30.7	36.5	29.9	2.9	1.05	137
Knowledge	15.7	35.1	38.8	10.4	1.44	134
Having interests at heart	31.6	29.3	33.1	6.0	1.14	133
Capacity to manage risk	18.1	29.0	26.8	26.1	1.61	138

Table 3.6 Percentages and mean scores for local government on trust items

Scientists:

	% Not at all	% A little	% Somewhat	% Very much	Mean	N
Trust in giving information	8.1	24.4	43.7	23.7	1.83	135
Knowledge	2.9	15.3	38.7	43.1	2.22	137
Having interests at heart	15.9	31.1	36.4	16.7	1.54	132
Capacity to manage risk	20.1	27.6	31.3	20.9	1.53	134

Table 3.7 Percentages and mean scores for scientists on trust items

Local Community Figures:

	% Not at all	% A little	% Somewhat	% Very much	Mean	N
Trust in giving information	30.8	44.4	20.3	4.5	.98	133
Knowledge	20.9	43.3	29.9	6.0	1.21	134
Having interests at heart	24.2	36.7	35.2	3.9	1.19	128
Capacity to manage risk	29.3	39.1	24.1	7.5	1.10	133

Table 3.8 Percentages and mean scores for local community figures on trust items

The Media:

	% Not at all	% A little	% Somewhat	% Very much	Mean	N
Trust in giving information	21.0	36.2	36.2	6.5	1.28	138
Knowledge	13.4	38.1	41.0	7.5	1.43	134
Having interests at heart	39.8	33.1	22.6	4.5	1.19	133
Capacity to manage risk	47.7	30.3	15.2	6.8	.81	132

Table 3.9 Percentages and mean scores for the media on trust items

Friends and Family:

	% Not at all	% A little	% Somewhat	% Very much	Mean	N
Trust in giving information	16.1	36.5	35.8	11.7	1.43	137
Knowledge	21.4	51.1	22.1	5.3	1.11	131
Having interests at heart	4.6	8.4	26.7	60.3	2.43	131
Capacity to manage risk	38.6	44.7	9.8	6.8	.85	132

Table 3.10 Percentages and mean scores for friends and family on trust items

In order to establish which of the six 'agents' were rated highest in terms of each trust item, a set of 2 x 2 x 6 (gender by affgp by agent) ANOVAs were run, with repeated measures on the last factor.

For trust in providing accurate risk information, there were no significant differences as a function of gender (p=.28), affgp (p=.51) or the interaction of affgp with agent (p=.33). There was a significant main effect for agent ($F(5,620)= 23.52$, $p<.001$, $eta^2=.16$). This reflected high scores for scientists. There was also a significant gender by agent interaction ($F(5,124) = 3.21$, $p<.01$, $eta^2 = .03$). This mainly reflected the fact that males were even more trusting of scientists than were females (mean of 1.94 versus 1.72), but somewhat less trusting of friends and family (1.29 versus 1.52).

For the measure on who has the most knowledge about the risks of EWEs, again there was a main effect for agent ($F(5,610)=52.78$, $p<.001$, $eta^2=.30$), but not for the interaction between agent and gender (p=.74), for affgp or between agent and affgp (p=.25). The effect for agent reflected the fact that scientists are rated as by far the most knowledgeable (M=2.24) and friends and family the least (M=1.10). Please note that these means are slightly

different than the means presented in the descriptive tables above and this is due to missing values. There was also no significant effect for gender (p=.47).

For the item asking who had people's interests at heart, there was a marginal effect of gender ($F(1,121)=3.21$, $p<.08$, $eta^2 = .03$), reflecting a slightly higher overall mean, averaged across agents, for males (1.44) than for females (1.25). There were no significant effects of prior experience (p=.12) and the interaction of prior experience with agent (p=.08). There was again a strong main effect for agent ($F(5,60)=75.94$, $p<.001$, $eta^2 = .38$), and a significant agent and gender interaction ($F(5,60) =2.85$, $p<.02$, $eta^2 = .02$). This was reflected as a particularly high rating for friends and family (M=2.41), especially by females (M=2.49).

For the degree to which agents have the capacity to manage the risks, there was yet again a big main effect for agent ($F(5,620)=37.59$, $p<.001$, $eta^2=.23$). This was reflected in a higher rating for national government (mean=1.66), local government (M=1.64) and scientists (M=1.59) compared with much lower ratings for the media (mean=.82) and friends and family (mean=.83). There was no significant effect for gender (p=.39), the interaction of gender and agent (p=.53), affgp (p=.50) and the interaction of affgp and agent (p=.53).

The results above give the relationships between gender, affgp and agent for each of the trust measures independently, but it is also useful to see how each measure of trust correlates across the six agents. These correlations are presented in Tables 3.11 to 3.16 for each agent.

	Trust in giving information	Knowledge	Having interests at heart	Capacity to manage risk
Trust in giving information	-	r=.56 p<.001 df=133	r=.56 p<.001 df=132	r=.25 p<.01 df=133
Knowledge	-	-	r=.46 p<.001 df=132	r=.38 p<.001 df=133
Having interests at heart	-	-	-	r=.29 p=.001 df=132

Table 3.11 Correlations between trust items for the national government

	Trust in giving information	**Knowledge**	**Having interests at heart**	**Capacity to manage risk**
Trust in giving information	-	r=.53 p<.001 df=133	r=.63 p<.001 df=132	r=.33 p<.001 df=135
Knowledge	-	-	r=.52 p<.001 df=131	r=.44 p<.001 df=133
Having interests at heart	-	-	-	r=.37 p<.001 df=132

Table 3.12 Correlations between trust items for the local government

Scientists

	Trust in giving information	Knowledge	Having interests at heart	Capacity to manage risk
Trust in giving information	-	r=.74 p<.001 df=132	r=.59 p<.001 df=130	r=.47 p<.001 df=132
Knowledge	-	-	r=.57 p<.001 df=131	r=.43 p<.001 df=133
Having interests at heart	-	-	-	r=.52 p<.001 df=131

Table 3.13 Correlations between trust items for scientists

	Trust in giving information	**Knowledge**	**Having interests at heart**	**Capacity to manage risk**
Trust in giving information	-	r=.59 p<.001 df=130	r=.66 p<.001 df=123	r=.38 p<.001 df=129
Knowledge	-	-	r=.48 p<.001 df=127	r=.46 p<.001 df=131
Having interests at heart	-	-	-	r=.36 p<.001 df=126

Table 3.14 Correlations between trust items for local community figures

	Trust in giving information	Knowledge	Having interests at heart	Capacity to manage risk
Trust in giving information	-	r=.67 p<.001 df=133	r=.46 p<.001 df=131	r=.23 p<.01 df=130
Knowledge	-	-	r=.46 p<.001 df=131	r=.26 p<.01 df=130
Having interests at heart	-	-	-	r=.36 p<.001 df=128

Table 3.15 Correlations between trust items for the media

Friends and family

	Trust in giving information	Knowledge	Having interests at heart	Capacity to manage risk
Trust in giving information	-	r=.49 p<.001 df=130	r=.20 p<.05 df=129	r=.34 p<.001 df=131
Knowledge	-	-	r=.16 *p=.07 df=127	r=.42 p<.001 df=128
Having interests at heart	-	-	-	r=-.00 *p=.96 df=128

*non-significant

Table 3.16 Correlations between trust items for friends and family

Correlations for the different trust items are significant on all items in all agents, despite the differences identified through the ANOVAs presented above, except for the last agent, friends and family. For this agent, having participants' interests at heart is not significantly correlated with either knowledge or capacity to manage.

Following on from the above analysis a set of regressions was then run on the trust items, with the four measures of trust separated into two independent and two dependent variables. Stepwise regressions were considered but rejected as there were only two predictor variables. Perceived knowledge levels and the perceived degree to which the agents are rated to have participants' interests at heart were entered as possible predictors of perceived trust of each agent in giving accurate information and perceived ability to manage the risks.

Firstly, regressions were run to predict perceived accuracy of information from knowledge and interests at heart and it was found that accuracy is quite well predicted from both knowledge and interests. R Squares show that more than 50% of the variance was accounted for in two and over 40% in three out of the six agents, with friends and family as the exception. R Squares are shown in Table 3.17.

Agent	**R Square**	**Knowledge**		**Interests**	
		Beta	**T**	**Beta**	**t**
National Government	.43	.38	5,12***	.38	5.10***
Local Government	.45	.27	3.58***	.49	6.40***
Scientists	.59	.61	8.73***	.24	3.42***
Local Community Figures	.53	.35	4.92***	.50	7.02***
The Media	.47	.58	8.00***	.19	2.66**
Friends and Family	.26	.47	6.04***	.13	1.61, ns.

** $p < .01$; *** $p < .001$.

Table 3.17 *Regression statistics for predictions of perceived accuracy of information from perceived knowledge and having interests at heart*

Knowledge is a more important predictor than interests for both scientists and the media. This is despite the fact that scientists (M=2.22) are regarded as much more knowledgeable than the media (M=1.43), (Essentially, the more scientists are seen as knowledgeable, the more they are trusted and the less the media are seen as knowledgeable, the less they are trusted.) In contrast, having interests at heart is a more important predictor than knowledge for local government and local community figures, although neither score highly on this characteristic (Ms = 1.14 and 1.19 respectively). For national government, both knowledge (M = 1.67) and interests (M=0.96) are important predictors. Friends and family stands out in having a lower R Square (.26) and no significant effect

of interests, although scoring highest on this characteristic (M=2.43), so in other words only knowledge makes a difference.

A similar analysis was run with capacity to manage the risks rather than trust in accuracy of information as the dependent variable. R Squares are much lower here, accounting for less than 30% of the variance for all agents, but are still significant and are presented in Table 3.18.

Agent	**R Square**	**Knowledge Beta**	**T**	**Interests Beta**	**t**
National Government	.16	.31	3.45***	.15	1.60, ns.
Local Government	.22	.34	3.73***	.19	2.08*
Scientists	.29	.21	2.28*	.40	4.38***
Local Community Figures	.24	.37	4.16***	.19	2.06*
The Media	.14	.12	1.24, ns.	.31	3.27***
Friends and Family	.18	.43	5.22***	-.07	-.89, ns.

** p < .05; *** p < .001*

Table 3.18 Regression statistics for prediction of capacity to manage the risks from perceived knowledge and having interests at heart

Knowledge seems a bit more important here, relatively (for example it is the only significant predictor for National Government and also for friends and family, with a particularly low mean for friends and family's capacity to manage risks (.85). However, having interests at heart now becomes more important than knowledge for scientists and the media The media have a very low mean score for capacity to manage the risks however (.81 compared to 1.53 for scientists).

Respondents were also asked who they would turn to first after an EWE; 55% said family, 48% said their insurance company, 33% said friends, 24%

their local council and only 7% said they would look to people with influence in their community.

Community and Place Attachment

(Items 2.3, 2.5, 2.6.1 to 2.6.11)

Seventy percent of respondents report feeling either moderately or very much attached to their community and 61% feel that they identify with it either moderately or very much. These items are highly correlated ($r = .707$, $p<.01$). These items were therefore combined to provide an independent variable ('commatt') for correlations to look for the degree to which community identity and attachment may predict measures relating to their own and others' role in managing the risk of extreme weather events.

Community attachment was found to be negatively correlated with feeling at personal risk from EWEs ($r = -.170$, $p<.05$).

On measures of perceived responsibility and ability towards helping other member of the community, no significant relationships were found between community attachment and feelings of responsibility to help neighbours to keep themselves and their properties safe. The same was true of perceived ability to do so.

Correlations were carried out on community attachment with items relating to collective action in preparation for EWEs;

- "There is little point in me doing things to protect my local environment from EWEs if my neighbours aren't doing the same"
- "I shouldn't have to take action against EWEs of others aren't doing the same"
- "The best way to help ourselves is by helping each other"

All of these relationships were found to be non-significant.

A section of the survey was also designed to explore feelings of attachment to place. A MANOVA of these items (2.6.1 to 2.6.11) with gender and affgp showed no significant effect for gender but did show an effect for prior experience ($F(11,124)=2.65$, $p<.01$, $eta^2=.19$). The effects were significant for items 2.6.4, "Losing material possessions doesn't bother me much" ($F(1,134)=5.43$, $p<.05$, $eta^2=.04$) with those affected more disagreeing with this statement more strongly, 2.6.6, "I would prefer to live here even if my property became more at risk from EWEs" ($F(1,134)=7.66$, $p<.01$, $eta^2=.05$), with those affected more also disagreeing more strongly, 2.6.10, "I think that dealing with the after effects of EWEs brings the community closer together" ($F(1,134)=4.19$, $p<.05$, $eta^2=.03$) and 2.6.11, "I think that dealing with the risks and uncertainty of EWEs brings the community closer together" ($F(1,134)=9.26$, $p<.01$, $eta^2=.07$) with those more affected agreeing more strongly with both statements. The means are presented in Table 3.19.

Item	Mean more affected	Mean less affected
2.6.4	-.95	-.57
2.6.6	-.48	-.03
2.6.10	1.02	.78
2.6.11	.79	.36

Table 3.19 Mean scores for place attachment items by prior experience group

(Items coded as follows: -2=strongly disagree, -1=disagree, 0=neither agree nor disagree, 1=agree, 2=strongly agree)

A MANCOVA was then run with the new variable commatt as a covariate. Significant main effects were found for affgp ($F(11,123)=2.97$, $p<.01$, $eta^2=.21$) and commatt ($F(11,123)=5.97$, $p<.001$, $eta^2=.35$) but not for gender.

Adjusted means are presented in Table 3.20.

Item	Key words	Mean for less affected	Mean for more affected
2.6.1	Live anywhere if self and family safe	-.20	-.27
2.6.2	Live anywhere if property safe	-.23	-.17
2.6.3	Have to learn to live with EWEs	.19	-.10
2.6.4	Material possessions not important	-.55	-.96
2.6.5	Moving away would bother them	.50	.45
2.6.6	Prefer to stay even if risk increases	.02	-.52
2.6.7	More than bad weather to move	.39	.05
2.6.8	Prefer to accept risks than leave place	.08	-.20
2.6.9	Prefer to accept risk than leave people	.06	-.13
2.6.10	After effects bring community closer	.80	1.00
2.6.11	Risks bring community closer	.38	.78

Table 3.20 Adjusted means for place attachment items following MANCOVA with 'commatt' as covariate

(Items coded as follows: -2=strongly disagree, -1=disagree, 0=neither agree nor disagree, 1=agree, 2=strongly agree)

Commatt showed significant correlations with nine out of the eleven items in this section. There was a significant negative correlation (r=-.26,

df=142, p<.01) with agreement with 2.6.1 ("I don't care too much where I live as long as my family and I are safe") and 2.6.2 ("I don't care too much where I live as long as my property is safe from damage"; r=-.26, df=142, p<.01). Significant positive correlations were found with 2.6.5 ("Having to move away from this neighbourhood due to extreme weather would really bother me"; r=.39, df=142, p<.001), 2.6.6 ("I would prefer to live here even if my property became more at risk from EWEs"; r=.27, df=140, p=.001), 2.6.7 ("It would take a lot more than bad weather to make me want to move away from here"; r=.34, df=141, p<.001), 2.6.8 ("I would rather accept the risks than move away from this house"; r=.28, df=141, p=.001), 2.6.9 ("I would rather accept the risks than move away from the people I know"; r=.32, df=141, p<.001), 2.6.10 ("I think that dealing with the after effects of EWEs brings the community closer together"; r=.20, df=142, p<.05) and 2.6.11 ("I think that dealing with the risks and uncertainty of EWEs brings the community closer together"; r=.20 df=141, p<.05).

Preparedness Behaviours

(Items 3.1a to 3.1e and 3.2.1 to 3.2.5)

61% of respondents report that they follow recommendations from the government in relation to protecting themselves from the impact of extreme weather events. 35% construct defences in their own homes and 25% attend community planning events. Only 12% campaign for action by the government and even less, 6%, organise community planning events. Table 3.21 summarises these results.

	% engagement in behaviour
Organise community meetings to exchange ideas and plan for EWEs	6
Attend community meetings to exchange ideas and plan for EWEs	25
Follow Recommendations from the local or national government	61
Construct defences in your own home	35
Campaign for action from the local or national government	12

Table 3.21 Percentages for reported behavioural engagement

A series of crosstabs were run to look for associations of engagement in behaviours with affgp and gender. For affgp an association was found for attending community meetings ($Chi^2(1)=12.63$, $p<.001$), with the more affected reporting higher attendance. For gender, there was a significant association with organising community meetings ($Chi^2(1)=4.17$, $p<.05$) and constructing defences in the home ($Chi^2(1)=4.27$, $p<.05$), with women reporting higher levels of engagement in both.

Participants were then asked to report how important they felt each of the behaviours to be. Compared with actual engagement, the figures for levels of importance for these same actions are much higher. Percentages for both are presented for comparison in Table 3.22.

Behaviour	% engagement in behaviour	% rating importance as moderate or extreme	N
Organise community meetings to exchange ideas and plan for EWEs	6	67	141
Attend community meetings to exchange ideas and plan for EWEs	25	65	141
Follow Recommendations from the local or national government	61	79	140
Construct defences in your own home	35	77	137
Campaign for action from the local or national government	12	74	139

Table 3.22 Percentages for behavioural engagement and perceived importance of behaviour items

A series of crosstabs and nonparametric correlations (Spearman's rho) were run to look at associations between each of the behaviours. Organising community meetings was significantly associated with attending community meetings (rho=.22, df=143, p=.01), with campaigning for action by the government (rho=.40, df=143, p<.001) and with constructing defences in the home (rho=.21, df=143, p=.01). Attending community meetings was also associated with campaigning for action by the government (rho=.37, df=143, p<.001), as was constructing defences in the home (rho=.22, df=143, p<.01). All other associations between actual behaviours were non-significant. The significant associations between behaviours are summarized in Table 3.2

Item	3.1a	3.1b	3.1c	3.1d	3.1e
3.1a	-	rho=.22 p=.01 df=143	-	rho=.21 p=.01 df=143	rho=.40 p<.001 df=143
3.1b	-	-	-	-	rho=.37 p<.001 df=143
3.1c	-	-	-	-	
3.1d	-	-	-	-	rho=.22 p<.01 df=143
3.1e	-	-	-	-	-

Table 3.23 Correlations between reported engagement in preparedness behaviours

In order to examine associations between the importance ratings given to these behaviours, a repeated measures ANOVA was run. This showed a significant effect for 'items' ($F(4,132)=5.80$, $p<.001$, $eta^2=.15$). So, some behaviours were perceived as more important than others. The means are presented in Table 3.24.

Behaviour	Mean Importance Score
Organising community meetings	1.91
Attending community meetings	1.86
Following government recommendations	2.14
Constructing defences in the home	2.16
Campaigning for action by the government	2.07

Table 3.24 Means for importance ratings for behaviour items

(Items coded as follows: 0=not at all, 1=a little, 2=somewhat, 3=extremely)

Non-parametric correlations (Spearman's Rho) were run on the importance ratings and despite the effect shown above, all importance items showed a significant correlation (at the $p<.001$ level) with all others rather than only some as was the case for actual engagement in behaviours. These correlations are presented in Table 3.25.

Item	3.2.1	3.2.2	3.2.3	3.2.4	3.2.5
3.2.1	-	rho=.86 p<.001 141	rho=.47 p<.001 140	rho=.39 p<.001 137	rho=.53 p<.001 139
3.2.2	-	-	rho=.47 p<.001 140	rho=.47 p<.001 137	rho=.56 p<.001 139
3.2.3	-	-	-	rho=.35 p<.001 137	rho=.50 p<.001 139
3.2.4	-	-	-	-	rho=.31 p<.001 136
3.2.5	-	-	-	-	-

Table 3.25 Correlations between importance ratings for behaviour items

Relationships between behaviours and importance ratings

A series of correlations (also non-parametric, Spearman's Rho) were then carried out between actual engagement in preparedness behaviours and the perceived importance of these behaviours. These correlations are presented in Table 3.26.

Item	3.2.1	3.2.2	3.2.3	3.2.4	3.2.5
3.1a	rho=.19 p<.05 141	rho=.20 p<.05 141	-	-	rho=.20 p<.05 139
3.1b	rho=.28 p=.001 141	rho=.31 p<.001 141	-	-	-
3.1c	rho=.21 p<.05 141	rho=.19 p<.05 141	rho=.42 p<.001 140	-	rho=.18 p<.05 139
3.1d	rho=.21 p<.05 141	rho=.19 p<.05 141	-	rho=.47 p<.001 137	-
3.1e	-	rho=.18 p<.05 141	-	-	rho=.27 p=.001 139

Table 3.26 *Correlations between reported engagement in preparedness behaviours and importance ratings for behaviours*

All behaviours are significantly positively correlated with importance ratings for the same behaviour.

Climate Change

(Items 4.1, 4.2.1 to 4.2.7 and 4.3.1 to 4.3.18)

Descriptive Statistics

Participants were asked to respond to a number of statements about how they view changes in the climate and how they are managed. Firstly, they were asked if they believe that the climate is changing as a result of human activity or not. Response categories available were 'Yes', 'No' and 'Not sure'. Responses to this question are presented in Table 3.27.

Response	Frequency	%
Yes	84	59
No	16	11
Not sure	42	30

Table 3.27 Frequencies and percentages for beliefs as to whether the climate is changing due to human activity or not

They were then asked to report how much they think climate change contributed to a range of natural events around the world that occurred within the past year at the time of data collection, including the floods that had affected this sample. The scale was a five point Likert scale and ranged from 'Not at all', through 'A little' and 'Moderately' to 'Extremely', with an additional option of 'Don't know'. For reporting here, 'Not at all' and 'A little' have been grouped together, as have 'Moderately' and 'Extremely' to provide just two main groups, with 'Don't knows' being excluded from analysis and added here only for

descriptive value. The frequencies and percentages are presented in Table 3.28. N for all items in this table was 143.

Item	Event and date	Not at all/ A little	%	Moderately/ Extremely	%	Don't know
4.2.1	Asian Tsunami, Dec 2004	62	53	56	47	23
4.2.2	Hurricane Katrina USA, Aug 2005	51	45	62	55	28
4.2.3	Floods UK, Jul 2007	46	37	77	63	18
4.2.4	Wildfires California, Oct 2007	51	44	65	56	25
4.2.5	Floods Mexico, Oct/Nov 2007	43	41	62	59	34
4.2.6	Cyclone Bangladesh, Nov 2007	43	41	61	59	33
4.2.7	Tornadoes Tenessee, Jan 2008	47	46	54	53	35

Table 3.28 *Frequencies and percentages for the degree to which events are believed to have been caused by climate change*

To simplify these data, these variables were then recoded to exclude the 'Don't know' category and recoded as 4.2.1r to 4.2.7r. The recoded variables were then used for further analysis on the above ratings.

A MANOVA was run on the items but no significant associations were found for prior experience (p=.49) or gender (p=.58).

Item 4.1 was then recoded as a new variable named 'ccb', for 'climate change belief', with 'No' and 'Not sure' grouped together as '0' and 'Yes' as '1'. A MANOVA was then run using ccb with items 4.2.1 to 4.2.7. A significant multivariate effect was found for ccb ($F(7,88)=4.75$, $p<.001$, $eta^2=.27$), with significant univariate differences on all items. Those who agreed that the climate is changing as a result of human activity agreed more that climate change also contributed more to the specific events named in items 4.2.1 to

4.2.7. Mean scores for these items for each of the climate change belief groups are shown in Table 3.29.

Item	Event and date	Mean Score No/Not sure	Mean Score Yes
4.2.1r	Asian Tsunami, Dec 2004	.97	1.72
4.2.2r	Hurricane Katrina USA, Aug 2005	1.05	1.91
4.2.3r	Floods UK, Jul 2007	1.33	2.23
4.2.4r	Wildfires California, Oct 2007	.95	2.02
4.2.5r	Floods Mexico, Oct/Nov 2007	1.08	2.11
4.2.6r	Cyclone Bangladesh, Nov 2007	.97	1.95
4.2.7r	Tornadoes Tennessee, Jan 2008	.92	1.86

Table 3.29 Means for each event by climate change belief groups

(Items coded as follows: 0=not at all, 1=slightly, 2=somewhat, 3=extremely)

Items 4.3.1 to 4.3.18 covered a range of themes relating to attitudes and beliefs about climate change, the environment and the management of both. For reporting, these items have been grouped into sets of items that cover broadly similar themes.

Items 4.3.1 to 4.3.9 are related to beliefs about climate change and how it should be managed. A MANOVA was run on these items with gender and affgp. No significant effects were found for gender but there was a multivariate effect for affgp ($F(9,126)=.15$, $p<.05$, $eta^2=.15$). Significant univariate effects were shown for items 4.3.5 ($F(1,134)=5.92$, $p<.05$, $eta^2=.04$), 4.3.8

($F(1,134)=5.12$, $p<.05$, $eta^2=.04$) and 4.3.9 ($F(1,134)=12.20$, $p<.01$, $eta^2=.08$), with the more affected showing stronger disagreement with these statements. Means are presented in Table 3.30.

Item	Statement	More affected mean	Less affected mean
4.3.5	"There's no point in me doing anything about climate change until we know the facts for certain"	-.82	-.43
4.3.8	"I would prefer not to change my lifestyle if other methods can be found to deal with climate change"	-.32	.04
4.3.9	"It's the job of leaders, not ordinary people like us to do something about climate change"	-.67	-.09

Table 3.30 Means for significant results in climate change belief items by climate change belief group

(Items coded as follows: -2=strongly disagree, -1=disagree, 0=neither agree nor disagree, 1=agree, 2=strongly agree)

So, those who have been more affected by an EWE show more willingness to take action without knowing the facts, more willingness towards potential lifestyle change to deal with climate change and disagree less that it is only the job of leaders to take action.

A further MANOVA on these items with ccb showed a significant multivariate effect ($F(9,128)=11.10$, $p<.001$, $eta^2=.44$), reflecting significant differences on all items: 4.3.1 ($F(1,136)=51.52$, $p<.001$, $eta^2=.28$), 4.3.2 ($F(1,136)=13.86$, $p<.001$, $eta^2=.09$), 4.3.3 ($F(1,136)=35.27$, $p<.001$, $eta^2=.21$), 4.3.4 ($F(1,136)=18.53$, $p<.001$, $eta^2=.12$), 4.3.5 ($F(1,136)=54.91$, $p<.001$, $eta^2=.29$), 4.3.6 ($F(1,136)=18.08$, $p<.001$, $eta^2=.12$), 4.3.7 ($F(1,136)=25.91$, $p<.001$, $eta^2=.16$), 4.3.8 ($F(1,136)=16.32$, $p<.001$, $eta^2=.11$), 4.3.9 ($F(1,136)=7.89$, $p<.01$, $eta^2=.06$). Means are presented in Table 3.31.

Item	Statement	Yes mean	No/not sure mean
4.3.1	"I believe the risks of climate change have been greatly exaggerated"	-.74	.36
4.3.2	"Scientists now agree that climate change is really happening"	.82	.30
4.3.3	"There is nothing anyone can do to stop climate change happening"	-.82	.11
4.3.4	"There's plenty that can be done to prevent the worst effects of climate change on people"	.96	.36
4.3.5	"There's no point in me doing anything about climate change until we know the facts for certain"	-1.06	-.02
4.3.6	"There's plenty that can be done to prevent the worst effects of climate change on other species"	.88	.30
4.3.7	"There's plenty that can be done to prevent the worst effects of climate change on the natural environment"	.98	.36
4.3.8	"I would prefer not to change my lifestyle if other methods can be found to deal with climate change"	-.40	.23
4.3.9	"It's the job of leaders, not ordinary people like us to do something about climate change"	-.59	-.11

Table 3.31 *Means for climate change management items by climate change belief groups*

(Items coded as follows: -2=strongly disagree, -1=disagree, 0=neither agree nor disagree, 1=agree, 2=strongly agree)

Those who believe that the climate is changing as a result of human activity show stronger agreement with statements that reinforce that it is indeed happening, that reflect positive action to deal with it, and stronger disagreement with statements that reflect the sentiment that little can be done and that it is not the responsibility of ordinary people to take action. They also disagree more

strongly with the statement that they would rather not change their lifestyle if other methods could be found to deal with climate change.

Item 4.3.10 gave participants the opportunity to indicate whether they would prefer new technology or lifestyle change as a method for dealing with climate change. Responses were recorded on a five item scale, putting the two options in different value positions relative to each other:

- "New technology much more than lifestyle change"
- "New technology a bit more than lifestyle change"
- "Both about the same"
- "Lifestyle change a bit more than new technology"
- "Lifestyle change much more than new technology"

Crosstabs of this item by ccb showed that those who think that the climate is changing due to human activity are more likely to endorse lifestyle change than those who do not or who are not sure (Chi^2 (1)=8.62, $p<.01$). There was no significant effect of gender, but there was a significant effect for affgp, with those more affected also being more likely to endorse lifestyle change than those who were less affected ($Chi^2(1)=6.79$, $p<.01$).

Items 4.3.11a to 4.3.11f looked at who participants believe should be responsible for dealing with climate change. First, a 2x2x6 (gender x affgp by agent) ANOVA with repeated measures on the last factor was run. Since all responses on this item added to 100, the interest here is only on the main effect for agent and the interactions between agent and the group factors. This analysis showed a highly significant main effect for agent ($F(5,525)= 46.27$. $p<.001$,$eta^2=.31$), as well as a significant affgp by agent interaction ($F(5,525)= 4.90$. $p<.001$,$eta^2=.05$). Means are presented in the Table 3.32.

Affected	Agent	Mean
Less	National Government	39.38
	Local Government	12.13
	Scientists	24.08
	Local Community Figures	5.14
	Media	16.27
	Friends and Family	8.43
More	National Government	27.22
	Local Government	19.12
	Scientists	30.38
	Local Community Figures	2.74
	Media	11.18
	Friends and Family	9.27

Table 3.32 *Mean scores for perceived level of responsibility for each agent in managing climate change by more and less affected group*

A similar 2x6 (ccb x agent) ANOVA was also performed to see if responses on this item were affected by general beliefs about climate change. This confirmed the strong effect for agent ($F(5,535)=40.50$, $p<.001$, $eta^2=.28$) but there was no ccb by agent interaction ($p=.81$).

Items 4.3.12 to 4.3.18 are related to more general ecological world views. Again, firstly a MANOVA was run with gender and affgp. No significant effect was found for gender again, but there was a significant effect for affgp ($F(7,127)=3.15$, $p<.01$, $eta^2=.15$). There were significant univariate effects on three items; 4.3.12 ($F(1,133)=5.05$, $p<.05$, $eta^2=.04$), 4.3.14 ($F(1,133)=4.78$,

$p<.05$, $eta^2=.04$) and 4.3.18 ($F(1,133)=7.98$, $p<.01$, $eta^2=.06$). Means are presented in Table 3.33.

Item	Statement	More affected mean	Less affected mean
4.3.12	"I believe that he natural world is a resource for the use of human beings"	-.23	.14
4.3.14	""I believe that human beings are more important than other species"	-.33	.06
4.3.18	"I believe that the natural world is more powerful than other human beings"	1.16	.77

Table 3.33 Mean scores for attitude to the natural environment items by more and less affected group

(Items coded as follows: -2= strongly disagree, -1=disagree, 0= neither agree nor disagree, 1=agree, 2= strongly agree)

So, those who were more affected by EWEs disagree more strongly that the natural world is a resource, that human are more important than other species and agree more strongly that the natural world is more powerful than human beings.

Relationships were also found for ccb with attitudes and beliefs about EWEs (items 1.1.1 to 1.1.12). A significant multivariate effect of ccb was found ($F(12,118)=3.31$, $p<.001$, $eta^2=.25$). Significant univariate effects were found for items 1.1.1 ($F(1,129)=11.36$, $p=.001$, $eta^2=.08$), 1.1.2 ($F(1,129)=9.44$, $p<.01$, $eta^2=.07$), 1.1.3 ($F(1,129)=18.30$, $p<.001$, $eta^2=.12$), 1.1.5 ($F(1,129)=10.82$, $p=.001$, $eta^2=.08$), 1.1.6 ($F(1,129)=15.26$, $p<.001$, $eta^2=.11$), 1.1.9 ($F(1,129)=6.47$, $p<.05$, $eta^2=.05$) and 1.1.12 ($F(1,129)=4.16$, $p<.05$, $eta^2=.03$). Means are presented in Table 3.34.

Item	Key words	Yes mean	No/Not sure mean
1.1.1	More severe	1.15	.67
1.1.2	More frequent in past	1.13	.67
1.1.3	More frequent future	1.08	.52
1.1.5	Difficult to predict	-.17	.44
1.1.6	Nothing to be done	.98	.42
1.1.9	Plenty can be done	.38	-.02
1.1.12	People who suffer are poor	.85	.52

Table 3.34 Means for EWE attitude items by climate change belief group

(Items coded as follows: -2= strongly disagree, -1=disagree, 0= neither agree nor disagree, 1=agree, 2= strongly agree)

Despite the absence of any explicit information in the questionnaire linking EWEs with climate change, those who believe that the climate is changing due to human activity also think that EWEs are becoming more severe, have become more frequent and will become more frequent. They also disagree more that there is nothing that can be done to stop EWEs from happening and agree more strongly that there is plenty that can be done to prevent the worst effects of EWEs on people. They also feel more at personal risk from EWEs and agree more strongly that they should as far as possible be prevented from occurring at all. These findings are in line with effects found between ccb and items 4.2.1r to 4.2.7r referring to specific events that had occurred around the world recently at the time of data collection.

Decision-making Confidence and Style

(Items 5.1 and 5.2)

The Melbourne Decision-making scale (Mann et al., 1998) rates first decision making confidence, then four decision-making styles: vigilance, procrastination, buck-passing, and hyper-vigilance. These items are scored by responding to statements by choosing "True for me", "Sometimes true" or "Not true for me" (2 to 0). The mean scores for decision-making confidence and styles (calculated according to Mann et al.'s instructions) are shown in Table 3.35.

Decision-making Measure	**N**	**Mean Score for sample**
Confidence	141	1.52
Vigilance	140	1.52
Buck-passing	139	.59
Procrastination	137	.49
Hyper-vigilance	137	.70

Table 3.35 Mean scores for decision making confidence and style

(Items coded as follows: 0=not true for me, 1=sometimes true for me, 2=not at all true for me)

Confidence in decision-making is positively correlated with vigilance ($r = .43$, $df = 138$, $p<.001$) and negatively correlated with the three other styles: Buck-passing ($r = -.59$, $df = 137$, $p>.001$), Procrastination ($r = -.59$, $df = 135$, $p<.001$) and Hyper-vigilance ($r = -.49$, $df = 135$, $p<.001$). This is not surprising in that a vigilant decision-making style indicates a tendency to evaluate all of the options and reach an optimum conclusion and it may be in part a lack of confidence that leads to the adoption of one or more of the maladaptive styles described below.

The three styles that are negatively correlated with decision-making confidence are also highly inter-correlated (buck-passing with procrastination r = .75, df = 135, p<.001; buck-passing with hyper-vigilance r = .67, df = 135, p<.001; procrastination with hyper-vigilance r = .70, df = 135, p<.001) and could perhaps be reduced to one style known, in contrast to 'vigilant' decision-making, as a 'maladaptive decision-making strategy'.

Decision-making Confidence with other variables

A MANOVA was conducted to look at relationships between decision making items with gender, prior experience and the interaction between the two. There was no significant effect for prior experience (p=.09) or the interaction between gender and prior experience (p=.21), but a significant main effect was found for gender ($F(5,129)=3.94$, $p<.01$, $eta^2=.13$). The significant univariate effects were only for confidence ($F(1, 133)=10.00$, $p<.01$, $eta^2=.07$) with women scoring themselves lower on decision making confidence than men (1.42 versus 1.61).

A further MANOVA was run of decision making items with ccb but no significant main effect was found (p=.32).

Chapter Four

Study One – UK Flood Risk Part II

Discussion

The design of the questionnaire was such that the findings fall into three main categories. Firstly, much of the information has predominantly descriptive value and as such does not need a great deal of further discussion. For example, beliefs as to the past, present and future severity and frequency of extreme weather events is of use in itself in gauging the general perception of risk in this sample location. Equally, knowing the levels of trust that the participants afford to the various entities outlined above also offers valuable insight into the current state of the relationships between the communities and these entities, in the particular context of extreme weather events, before examining further the relationships that have been revealed between these trust items and other themes within the survey. Due to the large volume of descriptive data across the range of themes, observations and comments on these items will be presented after a discussion of the more general cross cutting themes.

So firstly, the discussion will examine the second category of findings, which are those that offer a broader outline of the way in which cross-cutting themes, gender and prior experience, relate to other themes, offer reinforcement of existing theory and offer information that will aid the design of more specifically targeted future studies. Following the discussion of these underpinning themes, the individual findings from each of the questionnaire sections will be outlined and discussed by theme.

The third category of findings intended from the design are those of the cultural comparison with the data collected in a hurricane risk area in Belize and these comparisons are presented and discussed in Chapter Seven. Finally, a critique of the study will be offered as the discussion unfolds.

As explained in the results section, there were a number of possible ways in which the sample could have been split in relation to the extent and type of prior experience. Prior experience could have been categorised by data collection location as each village or suburb had been affected in slightly different ways, or by type of experience as reported in the first section of the questionnaire. Both of these methods were explored. The first was discarded due to the varying numbers of participants in each area and because to define type of experience by reports of how that area was impacted seemed unnecessarily assumptive considering the questionnaire had explicitly requested this information. So, preliminary analyses compared those answering yes or no in relation to each type of prior experienced (personal injury, damage to property, evacuation etc.) with other questionnaire items. When the Ns were taken into account for the different types of experiences it was realised that group sizes were in some cases so small as to render the value of any relationships minimal. So instead, computing the new variable 'affgp' following the discovery of a convenient median split for the extent to which participants reported having been affected by an event across all types of experience, was selected as a useful albeit more general way of exploring the relationship between degree of prior experience and other study themes.

For the section on attitudes and beliefs about EWEs, it was found that those in the more affected group were more likely to believe that EWEs will become more frequent in the next ten years, but not that they are becoming more severe or that they have become more frequent over the past ten years. It is interesting that it appears that personal experience has an effect on future events but not on those that have already happened. In other words, for those who have been more affected, their answers do not reflect a general trend towards worsening conditions up to and then beyond the event, but rather a sudden change towards a perception of worsening conditions having experienced an event. It may be that having experienced an event recently, the focus is now much more on the future than the past, or any ongoing trend, because people are now primed to the possibility of a reoccurrence. This would

be a very natural reaction to recent experience of an event at an evolutionary or instinctual level as there is no survival value in recalculating any threats that have already passed. So from a risk management perspective, it is helpful to know that, at least in the short term after an event, direct experience of that event is likely to increase the level of perceived threat for the future and hence is a good time to involve affected people in risk reduction strategies as long as the effects of any immediate trauma are acknowledged and managed.

Also in this section, responses to the statement 1.1.7 "when natural disasters happen the people who usually suffer the most are the poor" and "when natural disasters happen the people who usually suffer the most are those who've done the least to protect themselves" showed some very interesting differences. Those in the more affected group showed significantly less agreement with the idea that those who suffer the most are those who have done the least to protect themselves. This finding is in direct contrast to the 'belief in a just world' literature (Lerner, 1980) that would predict that there is a tendency for people to want to believe that bad things happen to people because they have done something to bring it upon themselves, rather than for no reason that can be controlled by the potential victims. It may be that in this case, rather than a test of the theory that people tend to assign blame to victims in order to feel safer and more in control themselves, the people who have already been more affected by the recent EWE do not want to believe that they were in any way responsible for being victims themselves. The 'just world theory' usually asks people about the levels of responsibility of other people for a negative experience and suggests that the assignment of blame is a defence mechanism against feeling at threat from a negative event themselves. In this case participants are being asked implicitly to judge their own potential role in a negative experience that has already occurred, hence it is too late for this type of defence mechanism, and this may be the reason for the conflicting finding here. Theory aside, it makes intuitive sense that those who were more affected would prefer to believe that it was not down to their own lack of preparation.

It was expected that a relationship might be found between relative risk ratings and prior experience, but no such relationship emerged from the current data. It seemed logical that when people had experienced an event in their own area this might lead them to give a higher risk rating for their immediate area

compared to the wider context such as their country. This could be explained, however, by the fact that all participants were living in an area that had been impacted upon by the flooding whether or not they had been personally affected, so in terms of risk ratings for the area the important factor may not have been personal levels of experience but simply knowing that this area is at risk by having witnessed the event or heard about it from others. This raises a further observation that the study may have benefited by having another data set collected in areas that were either at risk but had not experienced any recent flooding, or that were not at risk of flooding at all, in order to make comparisons on items such as these. In the current study, the fact that design already incorporated a cross hazard and cross cultural element it was decided to sacrifice this area, but in future studies designed to explore particular themes further within the UK, this would be a valuable additional element to include.

For the trust section there was no significant main effect for prior experience and this was also a surprise. It may however be explained by the fact that data were collected at a time when the impact of the flooding was still very much in evidence and authorities, whilst having dealt with the immediate consequences, were still very much engaged in dealing with the aftermath. For example in Hull, many people in one of the two neighbourhoods had still been unable to return to their homes (and were therefore not present for the data collection) and this may have also had an impact on the responses of those who were living in a depleted neighbourhood in that they may have been too close the experience, time wise, to have had time for it to have impacted on their levels of trust in the various agents. For this reason, it could be useful to add a longitudinal element to future studies involving trust, especially if as was the case here an event was very recent at the time of initial data collection. It would be interesting, for example, to return once the neighbourhoods are fully restored to physical normality and take further measures of trust at this stage and even perhaps again at a further point in time once the longer term effects, plus considerations of future flood response and management have had time to be considered.

Another possible reason for the lack of effect of prior experience is that of the nature of the sample as outlined above, in terms of the fact that all of the sample had, even if they not even been present when the flooding actually

occurred, at least witnessed the effects, the aftermath and the impact on the place and the community. The fact that there are difference on prior experience on some themes indicates that there are indeed useful findings from this distinction, but in order to examine some of the other effects that did not materialise here but may exist in reality it would be useful to add a control group in future studies.

The section on community and place attachment offered some interesting effects of the current measure of prior experience. Those in the more affected group disagreed more strongly that losing material possessions does not bother them much and that they would prefer to live in the current location even if their property became more at risk. They also agreed more strongly that dealing with both the aftermath and the risks of EWEs brings the community closer together. So those who had been more affected showed a higher level of concern for their property and possessions in relation to future and felt that the risks and impact of EWEs have an impact on community cohesion. This finding supports the earlier relationship between level of experience and an increase in perceived future threat levels.

It makes intuitive sense that those who have been more affected may feel that dealing with risks and events bring the community closer together. This has been observed in communities the world over when a crisis occurs of whatever kind. What was interesting was that it was thought that there may be a difference between dealing with the aftermath and dealing with the risks and it often appears that it is only when an event has actually impacted on a community that people pull together. In this study, however, this feeling was reported for dealing with the risks as well as the aftermath. This could be because the whole sample was from an area recently impacted by an event and this may have led to a temporarily increased sense of community per se that could in turn have impacted on responses to both these items.

When comparing prior experience with behavioural engagement, it was found that the more affected group reported higher attendance at community meetings to plan for extreme weather events. This is a really useful finding in terms of the impact of prior experience as suggests that direct personal experience contributes to getting together to deal with the risks collectively.

A relationship was also found between prior experience and beliefs as to how climate change should be managed and this is interesting firstly in pointing towards a link between attitudes towards EWEs and towards the broader theme of changes to the climate in general as the two may not have necessarily been associated at all. Those who had been more affected reported more willingness to take action to mitigate climate change without knowing all the facts, more willingness towards lifestyle change to deal with climate change and they tended to disagree more that it is the job of leaders rather than ordinary people to take action. These findings point towards a tendency for those who have been more affected to feel more proactive in taking action themselves, even when the nature of the risks is uncertain.

So, the role of prior experience in attitudes, perceptions and beliefs about extreme weather, climate change and their management is clearly a complex one and in need of further and more in depth exploration. These findings do however provide evidence that direct personal experience of EWEs does have some effect on how people view future risks related both to EWEs and to climate change.

Gender

As with prior experience, gender differences were found in a number of areas. Firstly, women were found to believe that EWEs are becoming more severe, have become more frequent, are likely to become more frequent, prefer not think about them and that they should as far as possible be prevented from happening in the first place. This finding is in line with risk perception research in general in that women show a tendency to rate risks more highly than do men (e.g. Pidgeon et al., 2003).

In general women think that the various agents have their interests at heart less so than do men, with the exception of friends and family. This may reflect a general tendency for women to place more importance and therefore trust in personal relationships than in those professionals involved in managing risk in their respective ways. If this is the case, it would have some very

valuable implications in how to present risk information and encouragement individual risk management for the different genders. For example, presenting risk information via the authorities and media may be more effective for men whilst encouraging cooperation and learning via friends and family, and therefore perhaps the community in general, may be a more useful approach for women.

For measures of behavioural engagement, it was interesting to discover that women are more likely to organise community meetings than men (although the number of people engaging in this behaviour at all was very low) and to construct defences in the home. It would be easy to assume that those taking up leadership positions in the community would be men. Also, given that the most common way to protect the home from flooding is using sandbags or building physical structures this may also be assumed more likely to be a male role. Yet, as commented on above, women may be more oriented to action that is based in the home and the community than are men, whilst men may actually be more likely to take up roles through local institutions or their workplace rather than in the immediate community. In the UK, especially since the last World War, despite the traditional perception of the man as head of household, women have had the practical role of protecting and managing the home and family and this may still be the case more so than it immediately appears. This again has valuable implications for communicating risk at household and community level as the target audience for such communications may currently be being largely overlooked. This theme will be revisited in the cultural comparison chapter (Chapter 7).

The only further gender difference found in this study was for decision making confidence and this reinforces Mann et al,'s (1998) findings that in general men report a tendency to feel more confident in making decisions than do women. There are no further conclusions to be drawn from this finding as it does not show any relationship to other themes in this study or offer any further information as to how this may affect decision making in the context of EWEs and climate change. A more detailed discussion of the decision making section of the study will come later.

Gender differences were not found in most of the main themes in the study and this is in itself interesting given the tendency towards gender differences in general. For example, gender differences were not found for perceived levels of responsibility and efficacy in managing the risks of EWEs, which may have been expected given the gender difference in decision making confidence. The latter is a general rather than a context specific finding however. Given the differences found in the trust section, it would clearly be of value to design and conduct further studies that examine specifically the role of gender in responding to and managing the risks of EWEs, in particular further exploration of how gender differences in trust may impact upon attention to risk messages, preparedness and response.

Having examined the underpinning themes of prior experience and gender, other findings will be discussed for each of the main questionnaire sections.

Perception of risk and beliefs about EWEs

In the list of types of prior experience, participants were asked to report feelings of personal danger. On reflection, this is clearly a highly subjective measure relative to other items in the same scale, but it is interesting that despite the scale of the flooding and the degree of damage and disruption caused, that perceptions of personal danger were so low. This is an important issue when many disaster risk reduction policies are designed with personal safety as the main focus, which can lead to an assumption that personal safety is the prime concern of those living in high risk areas. If this assumption is untrue, it could help to explain why people do not always appear to take action that is optimum for protecting their own safety if either prior experience or attitudes towards a risk have led them to be more concerned about protecting their property and minimising disruption to daily activities.

There is a clear general trend towards thinking that EWEs are becoming worse, despite the absence of a difference between those who have been more or less affected by it. This is in itself useful as descriptive information as the

belief that the risk is becoming greater is likely to have an impact on the readiness of people to respond to preparedness measures in the future. As mentioned earlier, the fact that the sample as a whole was from an area that had just been impacted heavily upon by flooding means that, regardless of level of personal experience within the sample, it is important not to rule out the possibility that this recent event has primed the participants to see the risk as increasing more so than a sample from an unaffected area. It would be useful to have such a control group in future studies. Also worthy of note is that despite this general trend towards a perceived worsening of the risk, the sample does not think that EWEs are becoming more difficult to predict. It is not clear whether this statement is interpreted in terms of the predictability of the event itself, in other words whether people think that events are not becoming any more erratic in their patterns despite being more frequent and severe, or whether it is a measure of levels of trust in those who make the predictions. It is more likely, given later responses in the trust section, that this finding provides further reinforcement of the level of trust people place in scientists in being able to predict events, even if they are becoming more frequent and more severe.

Responses to the statement about whether the poor are more affected by EWEs were not as expected. The responses were fairly evenly, which was a surprise given that it is clear around the world the people who are impacted the most by extreme weather events overall are those living in lower income countries and within those countries, those who are living in more high risk areas due to the lower cost of the land or displacement for other reasons. It may be that this statement was a little too ambiguous as it is not clear whether it is referring to those with lower incomes in the UK, or around the world. If it is taken to mean those on lower incomes in their own area, then it may be that people have witnessed the fact that flooding devastated lower and higher income neighbourhoods alike.

Perceived personal responsibility for and ability to protect self, property and others

There was an interesting discrepancy in the way in which people reported their feelings of responsibility for helping others. There was strong agreement with the phrase "the best way we can help ourselves in by helping each other" but no correlation between these items and those relating to felt responsibility for helping others. It seems that whilst there is a general theoretical recognition that it is a good idea to pull together, the relationship between this and direct obligation to others in this context is not a straight connection. This is similar to the finding that importance ratings for preparedness behaviours were far higher than actual engagement in the same behaviours. It would be interesting to conduct a specific study to explore the relationships between these gaps more fully as the relationship between the concept of what is best and what people feel they should do is clearly not a simple one.

The measures of perceived responsibility and ability to protect self, property and others from the risks of EWEs showed that when people felt more responsible they also felt more able. This finding is useful in that it shows that there is some relationship between the two in terms of direction but there are clear discrepancies between actual scores on responsibility and efficacy. The current study does not provide data to explain this gap but gives evidence of its existence and suggests the need for further studies to explore what factors may be responsible. It would be a natural assumption on the part of policy makers that if people feel both responsible and able to protect themselves and others then they would indeed do so. The evidence here suggests, however, that whilst feelings of responsibility are relatively high, there is something stopping many people feeling able to translate this into action. This is a key area for further investigation.

Responses to these items indicate that the sample in general is not strongly motivated by the actions of others and this is useful information in terms of designing policies and strategies to bring about behavioural changes. For example, one strategy often used in promoting behaviour change is to suggest that others are already engaged in an action with the hope that this in itself will encourage other to follow suit. This is undoubtedly the case with some people in some contexts but this study highlights how dangerous and wasteful of resources it could be to assume that this would be a useful strategy for encouraging preparedness behaviours in the context of EWEs.

Almost one quarter of the sample do not believe that they are responsible for keeping themselves safe from EWEs. It would be useful to know who these people believe is responsible for their safety and that or their family given that they feel that they are not. However, no items were designed specifically to ask who else they think should be responsible for their safety in this study. The current value of this finding is in the evidence that so many think someone else is responsible and this has serious implications for how to motivate these people to take care of themselves as an abdication of responsibility would be an essential first hurdle with this particular group.

Almost half of the sample says that they are prepared to take action despite uncertainty. Risk managers very rarely have access to accurate predictions and by necessity must work with uncertainty, so a population who are prepared to do the same is very valuable and this finding is therefore very encouraging in this respect. There is still a need however to address the group (almost one third of the sample) who do not wish to take action until they know the exact nature of the risk. It is very useful for policy makers to have information as to proportions of the population who would be willing to act with or without the facts as it allows them both to understand more about the different types of people they are trying to reach and to work on policies that have a much better chance of producing strategies that can succeed with the different target audiences.

Relative risk

These items were included in the study as they have been used in previous studies, also with UK community samples, designed to research attitudes about other environmental issues such as the building of wind farms and the use of contaminated land. As a stand-alone set of items, they do not provide enough information to make deductions but will be used in Chapter 7 as a cultural comparison with the Belize sample. In order to find out the reasons for these relative risk ratings, such as why so few believe their region is more at risk than other regions in the UK, why those who think that their homes are more at risk than others in the same neighbourhood believe this to be so, there would be need to be a further more targeted study. It is of course possible to pose theories at this point as to why these findings may be as they are. For example, it may be that there are physical explanations for some of these responses. For example those who rated that their homes are more at risk than others in the neighbourhood may live closer to a river, on lower ground, or be an older building with less water tight structures. Or it may be that these participants know that they have done less to protect their properties than others in the same neighbourhood. Equally those who rate that their region is more at risk than others in the country may be basing this on the simple fact that they had just been flooded and other regions had not at the time of the data collection. This information is not provided in the current study, but these descriptive statistics allow us to form theories and pose far more specific questions than was the case before the evidence was gathered.

It was also found, as mentioned in the prior experience section, that there was no effect of prior experience on perceptions of relative risk of this part of the country compared to others. This was interesting in that it may have been expected that recent experience of an event would lead to participants feeling that their own part of the country is more at risk than others. So this finding offers the contrasting possibility that there may not be a difference in perception caused by this recent exposure to an event after all. A more targeted study on

how exposure to an event's effects future risk perception would be useful in clearly up these apparent discrepancies.

Trust

The responses in this section do not indicate good overall levels of trust in the government at both a national and a local level and this is in itself useful to know as it is widely known, for example in politics in general, that without trust it is difficult to inspire change.

Trust in 'local community figures' also emerged as relatively low, but it is possible that this is at least in part due to the ambiguity of the term. Before drawing conclusions as to why such figures are not well trusted, it would be useful to explore who these figures are understood to be and then why the trust levels are so low relative to other sources of information. In a future study it may be useful to define more clearly the range of possible people this term may refer to, such as those who organise the community meetings, run the neighbourhood watch groups, and so on as it may be that in one community this figure is a church leader, in another an individual who is active in neighbourhood issues. It is also of course possible that in the communities studied in this research, the people who are in influential positions in the community did not provide the support the community had been expecting, but further investigation would be needed to answer this question.

It is not clear why in this case the national government is believed to know more about the risks. It may be that the local government's reaction in the sample areas caused the participants to lose faith, or that the national government have provided information that suggests a higher level of knowledge. It is interesting though that the general level of trust in the national and local government were equally low, but that on this item the responses were more spread. Comparisons of these data with actual types and levels of information presented by national and local government may prove to be a useful future study.

It is interesting that opinions about the media are so evenly distributed and it would be of value to explore the perceived role of the media further given how much of a central role they currently play in relaying risk messages to the general public. When it comes to friends and family, it is interesting that knowledge levels are perceived to be low but that general trust is relatively high, but more information on this is provided by responses to the next item in this section.

The degree to which people believe that the national and local government have their interests at heart echoes the responses to the item on trust in giving accurate information and may indicate a general lack of faith in the government in responding to the risk of EWEs. This is important for those working in disaster management as even when respondents in this study believe that the government have knowledge about how to manage EWEs, trust remains low and there is a perception that they do not have the people's interests at heart. This is clearly a political issue and may reflect more general attitudes to the current government, so is therefore beyond the scope of this study, but is never-the-less an important issue for further investigation.

It would be worth exploring further the reasons for the large difference in perceptions of what they know and how much they care about the end users of their work. It is possible that the general perception of scientists is that of people motivated primarily towards knowledge building rather than having any direct role in caring for people, which would lead to more neutral responses on this item. This further reinforces the value in exploring more fully the concept of scientists and their role in disaster risk reduction. This could include who exactly people are referring to when presented with the terms 'scientists' as it clearly covers a broad range of people and expertise and yet these people largely stay invisible to the general public, apart from quotes in media reports and the occasional specialist interview.

In terms of perceived capacity to manage EWEs, there is much to be explored further here. For example, the fact that such a large number rated that friends and family have little or no capacity to manage EWEs could indicate the tendency for respondents to believe that entities other than ordinary civilians should be responsible, that ordinary people do not possess the resources to

manage events, or that they are simply not capable. In other words it could be an issue of perceived responsibility, of empowerment or of efficacy.

It is interesting that in terms of relationships between trust items, for friends and family having people's interests at heart is not associated with either knowledge or capacity manage. This suggests that for these personal relationships trust is developed out of other factors, whilst for the rest of the agents it is perhaps necessary for them to display knowledge and ability in order to be perceived as having interests at heart. The regressions offered more information as to the relationship between trust items across the six agents. Trust in giving accurate information was predicted well from both knowledge and interests at heart for all but friends and family, reinforcing the above point.

Also, it was shown that for scientists and the media, knowledge is more important whilst for local community figures and local government, interests at heart was more important. It may well be the case that because people take it for granted that friends and family have your interests at heart, what makes the difference to perceived accuracy is perceived knowledge. In predicting capacity to manage the risks, having interests are heart became more important for scientists than knowledge. One conclusion could be that, if scientists are to be accepted as risk managers and not just communicators, their perceived motives become even more important.

In general, these results are very useful in giving information as to what elements of risk management are seen as more important for the agents and best predict trust in them. As pointed out earlier, trust is an important ingredient in the ability to bring about action and this information could be used to inform the respective agents as to where it may be both most important and effective for them to concentrate their efforts.

It was found that ratings of trust in scientists when it came to giving accurate information and levels of knowledge were high compared to the government and yet when it came to ratings for capacity to manage the risks the national and local government scored highly alongside scientists. So, the government at national and local level is believed to have the capacity to manage EWEs even though they are not so well trusted in other aspects of trust. The subsequent regressions showed that different aspects predicted trust

in giving accurate information and capacity to manage the risks for the different agents. This is a useful finding in that a clearer understanding of the different elements of trust and how they contribute to perceived risk management capabilities will help in building better relationships between the communities and those whose job it is to help them keep safe. The topic of trust, its different elements and how it impacts on how individuals respond to risk is an extremely complex one and central to efforts in improving preparedness and response. This is apparent both from the data and from direct experience in areas at risk from natural disasters. For example, observations of trust issues in an area at high risk from volcanic eruptions in Colombia, with several recent but harmless eruptions, gave further insight as to the complexity of these interactions. There, the level of trust in scientists is low for a number of reasons, mostly based on prior experience. Scientists working on volcanic risk in this region are unable, due to the nature of the threat and the degree to which the exact mechanisms of volcanic processes are so far understood, to provide warnings that are any more than very general. There are only three alert levels, with level one indicating that an eruption is already taking place, level two that one is possible "in the following days, weeks or months" and level three that there is no imminent threat. There have been three eruptions so far this year (September 2009) and in one case the alert state was moved from level three to one due to an unexpected explosion. The equipment and technology at the observatory here is of a high standard, as is the knowledge and expertise of the scientists. What is not available in this case is any kind of education about the way in which the risk is assessed and communicated and many people said that they are suspicious of the scientists and believe they have an agenda other than the safety of the communities. In this country history and politics appear also to play a strong role in attitudes towards those involved in risk management and highlights the complexity of the issue and the requirement to examine it in its wider context. In the USA throughout the tornado risk area, casual conversations showed that feelings about scientists were very mixed and often depended on what they perceive a scientist to be. For example some said that in the context of whether they would define a scientist as the "weather man" on the TV communicating the forecasts to them, whilst others said they are the researchers working on predictions behind the scenes. It would therefore be very useful to conduct a more detailed study specifically designed to explore

perceptions of, attitudes towards and perceived roles of scientists in the context of EWE risk management. Equally, trust is probably the most important theme to have emerged out of the current study and future studies should be designed to build on these initial findings and newly emerging questions.

Community and place attachment

The theme of community and place attachment was also a key theme during the design of the questionnaire, with a particular interest in the cultural comparisons. This will be explored in a later chapter, but as a within culture theme it also produced some very interesting results. Based on general observations and experiences in other cultures where communities live and work more closely on a day to basis than here in the UK, for example where extended families live and work together and decisions about issues that impact on residents are made by the communities themselves, it was expected that the level of perceived attachment to community would have an impact on how people feel about and react to EWEs and associated risks. For example, it is a generally accepted fact that a feeling of belonging to a community, whatever shape that community takes, enhances general feelings of security and wellbeing (e.g. McMillan & Chavis, 1986; Davidson and Cotter, 1991). Results in this study confirm this through the negative correlation between community attachment and perceived personal risk. It is also apparent and often acknowledged that in the developed world there is a general breakdown in traditional community life as it once was, partly as a result of the decline in attendance in church and the increasing tendency for families to live across much wider geographical areas. In addition, there is a cultural tendency in the western industrialised world towards individuality rather than collectivity. As a result, there are those who have continued to keep working at being connected as a community and those who have settled for a far more individualistic lifestyle. It was hypothesised that the latter may feel lower levels of community cohesion and this may impact on the way in which they respond to crisis in the form of environmental events. The findings in this section were mixed. It was a surprise that community cohesion did not correlate with feelings of responsibility

towards collective action. It is unclear why there is no relationship and before drawing conclusions it would be useful to design a more targeted study to confirm that this was not a fault in the design or methodology.

There were, however, relationships between level of attachment to community as a general concept and items relating to attachment to property and place. These findings indicate that attachment to community refers to a much more complex relationship than merely that of people to those who live around them, but to an interaction between people, their homes, their neighbours and the geographical location in which they live. This topic will be covered in more depth in the cultural comparison chapter but the current findings also give a valuable start point for generating further studies to explore the nature of these complex relationships and their implications for disaster risk reduction.

Preparedness behaviours

These behaviours were selected on the basis of the most likely courses of action available to the sample in the context. It is worth noting that they are different not only in individual action but in type. Organising community meetings, for example, is an action usually carried out by someone in an authority role or at the very least someone with a more proactive and self-motivated personality. The same can be said of campaigning for action. Following government recommendations and attending community meetings by contrast require acting on direction from others, other than deciding to engage in the behaviour in the first place. Constructing defences in the home could in actual fact come under the more general behaviour of following government recommendations but is more specific in terms of protecting one's own property, possessions and family. For this reason it is useful to examine each of them individually with other variables as they may have very different sources of motivation, or be indicative or different types of people within the sample.

The large differences between importance ratings and actual engagement in behaviours are of great importance as it would be easy to

assume that if people believe an action to be important then this will lead them to carry out this action, but clearly this is not the case. It may be that an acknowledgement of the importance of a behaviour indicates only that it is deemed important to be carried out by someone, but does not relate directly to ownership of any obligation to be the one to do so. The relationship between attitude and behaviour has been a topic of much discussion in the field of attitude research over the years and this could be seen as an example of the much studied attitude behaviour gap.

Relationships between the behaviours themselves indicate a tendency for those who organise community meetings to engage in other behaviours, in particular those behaviours which may be categorised as the more community oriented behaviours. Organising/attending community meetings and campaigning for action by the government share more associations than do following recommendations by the government and constructing defences in the home and could therefore be seen perhaps as more 'activist' style behaviours compared to those that rely on following the advice and instructions of others. In other words, following government recommendations and constructing defences in the home, could be seen as more self- and family-oriented behaviours and therefore less community spirited and directed towards change in a wider context then the home.

The significant relationship between rated importance of this activity and actual engagement in the behaviour is not necessarily surprising, but not a given considering the large gap shown above between engagement and perceived importance. The rated importance of attendance at community meetings by those who organise them is not at all surprising. Campaigning for action by the government is, as mentioned above, a comparably 'leaderful' style of behaviour and it is therefore not a surprise that this group of people rate is as important. What is less clear, however, is why there is only a significant correlation between organising meetings and the *rated importance* of campaigning, but not in actual engagement in campaigning behaviour.

Constructing defences in the home was rated as the most important behaviour and attending community meetings as the least. This is an indication of people's priorities within the UK sample but interesting when compared with

actual engagement, seeing as the most highly reported behaviour is following government recommendations and more people report attending community meetings than either organise them (not so surprisingly) or campaign for action.

Engagement in preparedness behaviours was, at the outset of the study design, intended to be a central theme. In analysing the data it has been found however that for a number of reasons these items did not offer as much information as had at first been hoped. Firstly and most importantly, these data are limited to self reporting of engagement in behaviours and as such is not a reliable indication of actual engagement in these behaviours. Secondly, there is a great deal of ambiguity as to exactly what these behaviours actually consist of *in real terms*. For example, following government recommendations would depend on what action people interpret this to be and it could include other listed behaviours in this study such as constructing defences or attending community meetings. Thirdly, many of the expected relationships between reported behavioural engagement and other behaviours were not found in this study, but this is as likely to be due to the above factors as much as to an indication of an absence of such associations in reality. For these reasons, this section has not ultimately been the given the amount of attention originally intended in relation to other questionnaire themes but is instead used as a valuable set of information in its own right and also as a useful foundation for the design of further studies on this theme.

Climate change

The first item in the climate change section asked participants whether they believe that the climate is changing as a result of human activity and whilst very few say that they believe that it is not and most say that they believe it is, there are still a large number who say that they do not know. On hindsight, it would have been useful for this question to have been in two parts, with the first asking whether they believe that the climate is changing at all, and the second the degree to which they believe that if so, it is a result of human activity. This may have reduced the number unwilling to commit to a yes or no to the way in

which the question was worded in this study. It is therefore unclear too, how many of those who said 'no' do believe that the climate is changing but not as a result of human activity.

As a result of the ambiguity outlined above, the answers given in the next section on the degree to which climate change may have been responsible for certain recent events may also be slightly less valuable and this might also explain why there is a relatively high use of the option 'don't know' for these items. They are nevertheless useful in showing a general link between beliefs about EWEs and climate change. It is of note that responses to the contribution of climate change to the Asian Tsunami, which was a geophysical rather than a hydro-meteorological event, are no lower than those for weather related events. There are of course some theories that climate change can also contribute to the incidence of earthquakes but this debate is largely confined to the scientific and political community. Here, it is more likely to represent a tendency to hold a general belief that climate change contributes to natural disasters per se or not, hence the lack of distinction between the types of event.

The event experienced by the sample was also included in the list to see if responses differed from those relating to more distance events. The responses for the UK flooding item did indeed show both the highest percentage of agreement and the lowest number of 'don't knows'. This offers more support to the theory that experience, direct or indirect, of an event may prime people to rate that risk more highly in the future. In this case, it is not a measure of direct risk perception of the event occurrence, but rather an indication that a phenomenon (climate change) that is believed to be an ongoing trend towards a changing global climate is believed to be having an impact on local events. This may be directly related to the responses in the first section in the survey in which those more affected were more likely to believe that EWEs will become more frequent in the next ten years. It is interesting, however (as discussed earlier) that there was no effect for prior experience for these items. It is possible, as commented on earlier, that this lack of difference within the sample could be explained by the fact that the whole sample live in an area impacted upon heavily by recent flooding even if the individual participants were not necessarily directly affected themselves. There was, however, an effect of climate change belief on the belief that EWEs are

becoming more severe and frequent and this provides more evidence that there is a strong link between perceptions of climate change and risks of EWEs.

There was however an effect of prior experience on items relating to action to mitigate the effects of climate change. Those more affected were more likely to show willingness to take action without knowing the facts, to change their lifestyle to mitigate the effects and to take ownership of the need to act. This is a very interesting finding in that it indicates that experience of an individual event, which has not been explicitly connected with climate change in the questionnaire, goes alongside an increased ownership of responsibility to take action against the effects of climate change. Findings relating to climate change belief and other items in this section show that those who agree that is changing show more positive attitudes towards both responsibility for taking action and the perceived ability to do so. These results are in part very much in line with common sense in that it is logical that those who believe it is happening are more likely to feel the need to do something about it, but further to this those who believe it is happening also show much greater willingness to take ownership of the solutions. This is very encouraging in terms of mitigating the effects as it could have been the case that people believed it to be happening but still felt that someone other than themselves should be responsible for dealing with it, as often appears to be the case in casual conversation and observation.

So, this section provides both valuable information as to the degree to which climate change is happening, how it should be managed and by whom, and also offers evidence of strong links between perceptions of EWEs and climate change.

The Melbourne Decision Making scale (Mann, 1998) was added to the questionnaire as it was thought that a simple existing measure of decision making style (as opposed to attempting to incorporate some of the more complex cognitive decision making models) may offer a useful comparison with other factors in this particular context. It was thought that decision making style may show some relationship with attitudes and behaviours and therefore possibly provide the beginnings of a framework for predicting how different types of people may make decisions in the context of EWEs. As it turns out, the use of the scale offered very little beyond the descriptive information as to the numbers who identify with each of the styles. The fact that three of the four styles correlate highly with each other weakens the value of splitting the sample by the four different styles, and in reality there is evidence in this study only of what may be termed a 'maladaptive style' (procrastination, buck-passing and hyper-vigilance), which essentially amounts to a style in which various strategies are employed to avoid considering all the factors, and vigilant decision making which is generally deemed to be a healthy style incorporating a full consideration of all the available information. It was hoped that there would be some effect of decision-making style on responses to other themes in the questionnaire, for example in attitudes towards responsibility and ability to take action to mitigate the effects of EWEs, but there were not and this has been disappointing.

Data from this section will be returned in the cultural comparison in Chapter Seven and a more in depth discussion of the theory and its expected application to this context will be offered in the final thesis discussion chapter.

As stated in the introduction, the questionnaire was designed to incorporate a large number of interwoven themes across a range of hazard contexts and in different cultural settings. For this reason it would not have been possible or useful to attempt to present and discuss every element included in the survey. For this reason, the current study has remained focused on those areas which emerged through examination and analysis of the data in specific areas that were deemed the most useful for offering factual information and

drawing initial conclusions as to how policy may be assisted and how future studies may be designed. In the next two chapters the same questionnaire has been used both to offer a further stand-alone study in a different location, with a different hazard, and to offer a cultural comparison by comparing data from the two studies. Following the UK study and the time constraints brought about by the flooding in July 2007, it was acknowledged that there would have been time to revise the questionnaire to focus on the main emerging themes from this chapter. This would have allowed a more detailed exploration of these themes whilst discarding those that had not produced the expected results. This option was rejected in favour of using the same questionnaire, albeit not ideal for the reasons already discussed, because the overall study design was to look for cultural differences and this would have been lost by the use of a revised and therefore different questionnaire. Instead, it was decided that data analysis would follow the themes that emerged in this first study.

Chapter Five

Study Two – Belize Hurricane Risk Part I

Background and Method

Belize is a former British colony occupying a strip of land bordering Mexico to the north, Guatemala to the west and south and the Caribbean Sea to the east. It gained independence on September 21st 1981, has since become a member of the United Nations and has a continued British military presence to support the country's security. The population is ethnically diverse, comprising a mixture of Afro-Caribbean (mainly Creole and Garifuna), Hispanic (immigrants from neighbouring Mexico and Guatemala, plus the Mestizo who are of mixed Mexican/Mayan descent) and a significant farming population of Mennonites, who are of European descent and settled in Central America following displacement from the USA.

Belize was chosen for this study for a number of reasons. Firstly, it was intended to choose a location in a hurricane risk area. This was to provide data in a cross-hazard and cross-cultural context to compare with the UK data. Within the hurricane risk area, which covers the south east corner of the USA, all of the Caribbean and parts of Central America, there were a number of options. It was decided to look for a population who were living in a high risk area and in a less well developed country to allow also for comparison across contrasting socio-economic and political conditions. As discussed in the introduction, a number of considerations had to be made in choosing a location that would provide a suitable context for cross-cultural research without causing an undue level of complexity. In working with indigenous populations there are so many differences in world view and cultural practice that in a study as broad as this one it was not deemed practical to include such a comparison. Equally, in much less developed countries the number of considerations around the ethics would be far larger. For practical reasons, it was also decided to look for

an English speaking location to reduce costs and difficulties in translating surveys and obtaining a translator. Various options were then followed up via available contacts including the Cayman Islands, Belize and Jamaica, with Belize ultimately offering the best conditions in terms of a varied sample, support available in-country and recent EWE experience. Belize is a very small country, but its population is extremely diverse as described above. Also, the British Army still have a large base there, for jungle training, and due to the fact that the author was still serving in the Reserve Forces at the time of data collection, free accommodation and food as well as support and logistics were offered. In terms of recent hazard experience, Hurricane Dean had hit the north of the country the year before.

The major events to impact on Belize over the past several decades are presented below:

1. 1942 – No name as the naming of hurricanes had not started yet. No warning, hit northern Belize including Sarteneja
2. 1955 – Hurricane Janet. Devastated Sarteneja.
3. 1961 – Hurricane Hattie. Destroyed much of Belize City and resulted in the capital being relocated inland to Belmopan.
4. 1978 – Hurricane Greta.
5. 1998 – Hurricane Mitch.
6. 2000 – Hurricane Keith. Destroyed much of the barrier reef island of Caye Caulker and also impacted on northern Belize.
7. 2001 – Hurricane Iris. Hit southern Belize.
8. 2007 – Hurricane Dean. Hit northern Belize and caused most damage in the area of Corozal and Sarteneja
9. 2008 – Tropical Storm Arthur. Hit the central coastal areas with high volumes of rain in a short period of time. Extensive flooding in Stann Creek and Belize District, in particular Gales Point, Hope Creek and Sittee River.

During the initial planning phase, the intention was to conduct data collection in the form of survey questionnaires in as broad a representation of the diverse population of the country as possible, and in as many areas affected by the above list of events as possible. This did not include Tropical Storm (TS) Arthur as it had not yet occurred at this stage. The questionnaire was basically the same as was used for the UK sample, with minor alterations to adapt it to the Belize sample, as the intention was to provide data on the same themes but that could offer a cultural comparison in a different hazard context. Hurricane Dean was known to have affected the north of the country the year before and other areas were known to have been impacted by other hurricanes as outlined above. Contact was made with the Commander of the British Army Training Support Unit, Belize (BATSUB) in order to organise accommodation and logistics and to discuss the best way to achieve this aim. It was agreed that arrangements to visit the desired communities would best be made on arrival rather than before due to the difficulty in trying to understand the physical and logistical constraints from afar. It was also not yet known who of the possible useful contacts would be available on arrival.

Only nine days before departing for Belize, on June 1st 2008, TS Arthur hit the central coast areas of Belize and caused an unforeseen disaster due to extensive flooding. This not only changed the plans in terms of presenting a new set of experiences on which to collect data if ethical considerations allowed it, but also had a significant impact on which parts of the country could be reached by car. The extent of the impact of TS Arthur was not clear until arrival and by then it was too late to ask specific questions about it in the questionnaire as copies had been made ready for distribution. This all meant that it was fortunate that the detailed planning had been left until arrival in the country so that the situation was able to be assessed in person and data collection adapted to maximise the value in light of the new situation.

On arrival in the country, initial information and contacts were made via the Commander of BATSUB as this was the host organisation and first point of contact in the country. A visit was arranged to the National Emergency Management Organisations (NEMO) in Belmopan to talk to members of the hierarchy about the situation following TS Arthur seeing as it was still causing

considerable upheaval in certain parts of the country, and also to talk about general emergency management policies in the country.

Response to emergencies is organised by NEMO at three levels; national, district and village level. Also, nine Emergency Management zones have been established, comprising the six districts (Belize, Cayo, Corozal, Orange Walk, Stann Creek and Toledo), plus three special zones (Belize City, the largest populated area; City of Belmopan, the national capital; San Pedro, the most vulnerable off-shore community). The flooding caused by TS Arthur had centred mainly on Stann Creek district and this would therefore be an interesting focus area for the research as long as ethical issues were given due consideration.

Another meeting was set up with the British High Commission (BHC) who offered contacts in their network of British 'ex-pat' wardens in the districts and zones outlined above. A number of these individuals were contacted and this led to access being facilitated to communities in three of the six districts and two of the special zones. The combination of contacts via BATSUB, NEMO and the BHC resulted in potential access to communities in four of the six districts and two of the special zones. It became apparent very early on, however, that in the aftermath of such a major event relying only on a questionnaire survey to gather data was potentially very limiting when so much could be learned through observations, conversations and time spent in the communities where there were so many stories to be told. In order to maximise the information gained in each location, field notes were also taken around the country alongside the questionnaires and records of spontaneous conversations and stories. It was clear that a combination of quantitative and qualitative data would be of more value than quantitative alone. Those communities that could be reached during the first visit were visited and data were collected from as many as possible over the range of different locations, but it was decided that a further field trip would be of great value in order to reach areas that at this stage were inaccessible and to spend greater amount of time in a smaller number of targeted communities to enhance the qualitative aspects of the study and take full advantage of the willingness of the people to talk at length about their recent experiences. A summary of the locations, when and how they were visited and

what the primary ethnicity of the people is provided in Table 4.1 and a map is presented in Figure 4.1.

Zone	Town	Location	Primary Ethnic Origin of Population	When visited and for what purpos
istrict	Gales Point	Central Coast	Creole	First visit June 08 in the immediate a Arthur for questionnaire surveys and gathering. Further two visits in Septe interviews and additional field notes
District	Corozal	North	Mestizo	June 08 for questionnaire surveys
District	Sarteneja	North east coast	Mestizo	Two visits in September 08 for inter and field notes
strict	San Ignacio	West	Hispanic	June 08 for survey questionnaires
reek	Dangriga and Hope Creek	Central Coast	Garifuna	June 08 for survey questionnaires
ity Zone	Belize City	Central Coast	Mixed	June 08 for survey questionnaires
lro Zone	San Pedro	Off-shore island	Mixed	September 08 for interview with disa expert

Table 4.1 Summary information on data collection locations in Belize

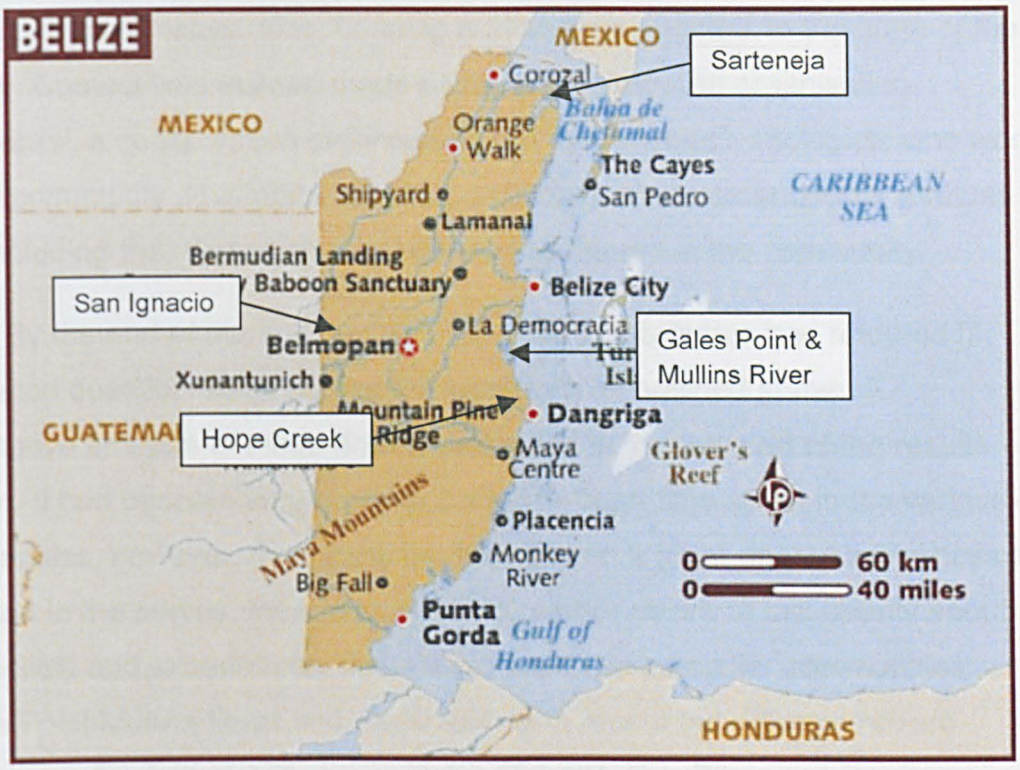

Figure 4.1 Map of Study Locations

Questionnaires were also distributed to locally employed staff in the BATSUB base. These participants came from all over Belize and therefore had varying degrees and types of experience of extreme weather events.

Due to the very recent upheaval caused by TS Arthur, it was particularly recommended by NEMO on the first field trip that a visit should be made and data collected in a village named Gales Point which, partly due to its rather isolated geographical position, had sometimes been neglected as a community and which had been physically cut off since the storm due the only bridge being washed away on the main road into the village. During that first month, it was made possible to reach Gales Point by the British Army, who provided transportation in and out of the village by helicopter. Training schedules only allowed for a 24 hour visit, and this was enough time to make initial contact with the village Chair, collect survey data from a number of villagers and begin to learn about the history of the village and the experiences of its inhabitants. It was not, however, possible to get to Sarteneja during this initial field trip due to

a continuation of heavy rains, flooding and bad road access to the north of the country. Contact was instead made by telephone with the organisation 'Wildtracks', a conservation organisation run by two British zoologists who work also in community development. An open invitation was extended for a future visit, including the offer of introductions to key figures in the community.

By the end of the first field trip, this broad distribution had returned 50 completed questionnaires across the communities outlined above. A quantitative analysis of these data is presented in the first part of the results section. It had become very much apparent through time spent in the various communities, however, that whilst there had been a great deal of willingness to take part in the survey, there was an even greater desire to talk openly about their beliefs and experiences. Also, there were two particular communities (Gales Point/Mullins River and Sarteneja) with recent but different hazard experience (TS Arthur that year in Gales Point/Mullins River and Hurricane Dean the previous year in Sarteneja), that were also culturally distinct (Hispanic/Mestizo in Sarteneja and Creole in Gales Point/Mullins River). In addition, relationships had been built to a certain extent during the 24 hour visit to Gales Point, not least because the village had been completely cut off for a number of weeks and because the villagers were on the whole delighted that anyone was taking an interest in their situation. The impact of TS Arthur had been great, but further south there had been much greater devastation caused by flash floods and in comparison the people of Gales Point were considered less of a priority in the relief effort. This reality was readily acknowledged by the villagers, but nonetheless they had identified many pressing issues that they also felt needed to be addressed very soon in order for their wellbeing not to be compromised any further. They were therefore very keen to share their ideas and experiences and extended an open invitation to return and learn more about them.

Also, despite not having been to Sarteneja in person, the conversation with the British scientists there opened up a clear opportunity to spend time in the town and gather further information about their situation, beliefs and experiences. This was the case too for the British Consulate warden, who was also a NEMO district co-ordinator, on the island of San Pedro who had been away for the duration of my visit but suggested a return visit at a future date if

possible. The location of San Pedro as an off-shore island has meant it has been the first point of landfall for hurricanes in the past and has a particularly interesting history in hurricane risk management.

A second field visit was therefore set up for September 2008, with the intention of spending time exclusively in these communities in order to conduct a more ethnographic follow up study, including semi-structured interviews and the gathering of observational and experiential field notes. It was decided to visit San Pedro only to interview the NEMO co-ordinator/British Consulate warden as he had a broad range of experience of hurricane risk management, as to conduct interviews in the island community at the same time would have reduced the time able to be spent in the other two locations.

The information gathered in these visits will be presented and discussed in depth later, but firstly an overview of the main findings of the questionnaire data is presented and reviewed.

As for the UK study, ethical issues were carefully considered and approval was sought through the appropriate channels. Of particular concern was the vulnerability of isolated communities in a less developed country and it was for this reason that advice was sought from sources in Belize on the most appropriate manner in which to approach these communities. Full explanations were given at all times regarding the voluntary nature of all aspects of participation in this research.

Quantitative Results

As previously explained the sample size was small for a number of practical and logistical reasons. In addition, the current study was designed largely as a cultural comparison with the UK study and therefore the majority of the results will be presented in the context of their relationship to the UK data set. For these reasons, the results presented here will be confined to descriptive information to introduce the sample and the main underpinning themes of gender and prior experience as used for the UK sample, in order to avoid

unnecessary repetition. The themes of trust and community attachment were also included in the main focus as a reflection of the findings from the UK study and to provide consistency in the way in which the data are explored and analysed.

These results will be presented following the order of the questionnaire sections.

Demographic Information

A total of 56 questionnaires were completed and returned. Of the 56 respondents, 33 (60%) were female, 22 (40%) male and one did not specify gender. Seventy six percent identified themselves as Christian. The remainder identified themselves as agnostic, Sikh and 'other'. There was an oversight here in that there is an indigenous population in Belize and this category was not included in the questionnaire. The 18% percent who identified themselves as 'other' may have been in this category but it is not possible to confirm this. Six participants did not respond to this item. There was a similar and more significant oversight in the ethnic background section, which was not modified from the UK version. The categories are likely to have been confusing for a Belizean sample and as a consequence, 24% identified themselves as 'Black Caribbean', 10% as 'Black or black British African', 10% as 'Mixed white and black Caribbean' and 6% as 'Mixed white and black African'. As for the religion category, Belizean variations were overlooked in this questionnaire and therefore Hispanic and Indigenous categories were not included. Members of these populations are likely to be represented in the 30% who classified themselves as 'Other' and 4% as 'Mixed other'.

Of the total sample, 61% were homeowners. Forty-eight percent of the participants are employed full-time and 27% are self-employed. The remainder are employed part time (10%), in education (10%), unemployed (2%) or a 'homemaker' (2%). Four participants did not provide a response for this item.

Of the 56 respondents, 37 (66%) reported having been affected by hurricanes/windstorms in some way and 36 (64%) by flooding. When asked how they had been affected, these respondents described their experience in terms of the categories shown in Table 4.2.

How affected	**%**
Personal injury	4
Perceived personal danger	18
Damage to property	57
Evacuation	45
Damage to workplace	29
Disruption to work	43
Disruption to transport/travel	39
Loss of services	46

Table 4.2 Frequencies for experience by type

In these events property damage affected the sample the most, with evacuation, disruption to work and travel, and loss of services all also having a relatively high impact.

The data were then reduced, as in the UK sample, into the variable 'anyaff' in order to give a count of the total number of impacts experienced by each participant, of any kind. This computed variable ranged from 0 to 7 around a mean of 2.84 (SD = 2.04). Six of the sample (11%) reported no impact, a further 15 (27%) just one impact, and 5 (9%) reported two impacts. This meant that 26 (46%) had two or fewer impacts so it was therefore decided to split the

sample into the 46% reporting two or fewer impacts overall and the 54% experiencing three or more. The group variable was again named 'affgp' and the two groups were labelled 'less affected' and 'more affected'.

A series of multivariate analyses were run with affgp and gender as the independent variables on each section of the remainder of the questionnaire.

Perception of risk and beliefs about EWEs

(Items 1.1.1 to 1.1.12)

No significant effects were found for gender (p=.18), prior experience (p=.78) or their interaction (p=.46) on these items.

Perceived personal responsibility for self, property and others

(Items 1.2.1, 1.2.3, 1.2.5, 1.2.7)

No significant effects were found for gender (p=.99) but a marginal effect was found for prior experience ($F(4,47)=2.46$, $p=.06$, $eta^2=.17$). Univariate effects were found on item 1.2.3 ($F(1,50)=4.61$, $p<.05$, $eta^2=.08$). This reflected a higher mean for the more affected sample (M=1.14) indicating that they feel more responsible for protecting their own property from EWEs than do the less affected group (M=.64).

There was no significant effect for the interaction of gender and prior experience (p=.74).

Perceived personal ability to protect self, property and others

(Items 1.2.2, 1.2.4, 1.2.6, 1.2.8)

There was no significant effect of prior experience (p=.86) on these items, nor of the interaction of gender and prior experience (p=.11). There was however an effect of gender ($F(4,47)=2.89$, $p<.05$, $eta^2=.20$) and this was reflected in univariate differences for items 1.2.4 ($F(1,50)=9.34$, $p<.01$, $eta^2=.16$) and 1.2.8 ($F(1,50)=4.28$), $p<.05$, $eta^2=.08$). Men felt more able (M=.63) than women (M=-.24) to protect both their own and others' properties.

Perceived responsibility of others

(Items 1.3.1 to 1.3.5).

There were no significant main effects of gender (p=.95), prior experience (p=.89) or their interaction (p=.65) on these items.

Relative risk

(Items 1.4 to 1.6)

There were no significant main effects of gender (p=.24), prior experience (p=.77) or their interaction (p=.72) on these items.

Trust

(Items 1.7 to 1.10)

For the Belize sample there was no 'local government' agent as the small size of the country means that there is no need for the government to devolve power locally. As for the UK sample a series of 2 x 2 x 6 ANOVAs were run for gender and prior experience, with repeated measures on the last factor (agent). The results for the trust section are presented by trust item.

Trust in giving accurate information

For trust in providing accurate risk information, there was a significant main effect for agent ($F(4,156)= 15.34$, $p<.001$, $eta^2=.28$). This reflected high scores for scientists and the media and a low score for local community figures. There were no significant differences as a function of gender ($p=.45$), prior experience ($p=.38$) or the interaction ($p=.10$). There was also no significant gender by agent interaction ($p=.90$), prior experience by agent interaction ($p=.55$) or prior experience by gender by agent interaction ($p=.29$). Means are presented in Table 4.3.

Agent	**Mean**
National Government	1.64
Scientists	2.20
Local Community Figures	1.25
Media	2.26
Friends and family	1.90

Table 4.3 *Mean scores for trust in giving accurate information*

Knowledge about the risks

For levels of knowledge about the risks associated with EWEs, there was a significant main effect for agent ($F(4,164)= 17.43$, $p<.001$, $eta^2=.30$). This again reflected high scores for scientists and the media and a low score for local community figures. There were no significant differences as a function of gender ($p=.15$), prior experience ($p=.33$) but there was a significant effect for

the interaction (F(1,41)=11.17, p<.01, eta^2=.21). This was reflected in more affected women seeing all agents, on average, as more knowledgeable than do the more affected men. There was no significant gender by agent interaction (p=.74), prior experience by agent interaction (p=.45) or prior experience and gender by agent interaction (p=.11). Means are presented in Table 4.4.

Agent	**Mean**
National Government	1.94
Scientists	2.47
Local Community Figures	1.52
Media	2.26
Friends and family	1.73

Table 4.4 Mean scores for knowledge about the risk

Having people's interests at heart

For the level to which agents are perceived to have people's interests at heart, there was a significant main effect for agent (F(4,160)= 16.22, p<.001, eta^2=.29). This reflected a particularly high score for friends and family. There were no significant differences as a function of gender (p=.29), prior experience (p=.44) but there was a significant effect for the interaction (F(1,40)=11.08, p<.01, eta^2=.22). This reflected the fact that, among females, those less affected gave lower scores than those more affected, averaged across all agents (Ms = 1.53 vs. 2.03) whereas, among males, this difference was reversed (Ms = 2.40 vs. 1.59). There was no gender by agent interaction (p=.74), or prior experience by agent interaction (p=.45) but there was a significant prior experience and gender by agent interaction (F(4,160)=9.16, p<.001, eta^2=.13). This seems mainly to reflect the fact that the prior experience

by gender interaction just described did *not* occur with respect to friends and family. Means are presented in Table 4.5.

Agent	Mean
National Government	1.62
Scientists	1.76
Local Community Figures	1.56
Media	1.97
Friends and family	2.53

Table 4.5 Mean scores for having people's interests at heart

Capacity to manage EWEs

For perceived capacity to manage EWEs, there was again a significant main effect for agent ($F(4,160)=3.68$, $p<.01$, $eta^2=.08$). This reflected a higher score for national government. There were no significant differences as a function of gender ($p=.30$), prior experience ($p=.59$) but there was a significant effect for the interaction ($F(1,40)=7.46$, $p<.01$, $eta^2=.16$). As in the analysis of "interests at heart", less affected females gave lower scores than those more affected (Ms = 1.27 vs. 1.81) with this difference reversed for males (Ms = 1.90 vs. 1.54). There was no significant gender by agent interaction ($p=.48$), prior experience by agent interaction ($p=.35$) or prior experience and gender by agent interaction ($p=.55$). Means are presented in Table 4.6.

Agent	Mean
National Government	1.93
Scientists	1.59
Local Community Figures	1.40
Media	1.61
Friends and family	1.63

Table 4.6 Mean scores for capacity to manage

Community and Place Attachment

(Items 2.3, 2.5, 2.6.1 to 2.6.11)

A MANCOVA was run on the community and place attachment items with the variable 'commatt' run as a covariate, as for the UK data analysis. There were no significant main effects of gender (p=.79), prior experience (p=.12), their interaction (p=.49) or the covariate (p=.14) on these items.

Preparedness Behaviours

(Items 3.1a to 3.1e and 3.2.1 to 3.2.5)

As in the previous chapter, a series of crosstabs were run to look for relationships with engagement in preparedness behaviours. Again, no effects were found of gender or prior experience. A table of p values for gender and prior experience with each of the behaviours is presented in Table 4.7.

Behaviour	P value Gender	P value Prior Experience
Organise meetings	1.00	.24
Attend meetings	.82	.09
Follow government recommendations	.68	.71
Construct defences	.44	.21
Campaign	.60	.51

Table 4.7 Significance levels for reported behaviour by gender and prior experience

A MANOVA was also run on these items but again no significant effects were found of gender (p=.98), prior experience (p=.68) or their interaction (p=.05).

Climate Change

(Items 4.1, 4.2.1 to 4.2.7 and 4.3.1 to 4.3.18)

There were no significant main effects of gender (p=.91), prior experience (p=.08) or their interaction (p=.34) on items 4.2.1 to 4.2.7 (the degree to which climate change is believed to have contributed to specific events).

For items 4.3.1 to to 4.3.9 (general climate change beliefs) there were also no significant effects of gender (p=.41), prior experience (p=.34) or the interaction (p=.80).

An ANOVA on the items to measure preferences of technology versus lifestyle change in dealing with climate change showed no significant effects for gender (p=.88), prior experience (p=.67) or their interaction (p=.23).

A MANOVA on the ecological beliefs items (4.3.12 to 4.3.18) also showed no significant effects for gender (p=.84), prior experience (p=.10) or their interaction (p=.96).

Decision-making Confidence and Style

(Items 5.1 and 5.2)

A significant effect was found of prior experience ($F(5,46)=4.00$, $p<.01$, $eta^2=.30$), with univariate effects on vigilance ($F(1,50)=.6.77$, $p<.05$, $eta^2=.12$) and buck passing ($F(1,50)=8.82$, $p<.01$, $eta^2=.15$). Those more affected scored higher on the vigilant decision-making style (mean of 1.78 versus 1.53 for less affected group) and scored lower on the buck passing style (mean of .59 versus .91 for the less affected group).

There were no significant main effects for gender (p=.25) or for the interaction of gender and prior experience (p=.62).

Discussion of Quantitative Results.

The majority of the effects suffered by this sample by EWEs were in relation to damage to property and this is a theme that is covered in some depth in the following section of related experiences and thoughts from selected communities in Belize. As explained in the introduction to this chapter, the questionnaires were distributed widely across the country and therefore offer a broad representation of the many different communities and ethnic backgrounds in such a diverse and sparsely populated country. It is would therefore not be useful to compare directly this quantitative data set with the following qualitative section and the majority of the value of this data set is in comparison with the UK sample.

There are, however, a number of points worth making about the results presented above. There were very few effects found within this sample for gender and this is in itself worthy of note given the clear tendency for gender differences in general. It is hoped that comparison with the UK data set will offer further useful information on this theme but it would also be of interest to design a further study to examine the role of gender in attitudes and beliefs about EWEs in Belize.

Gender differences were only found for perceived ability to protect own and others' property and as an interaction with prior experience in that more affected women rated knowledge levels more highly across agents than did the more affected men. It is difficult to draw conclusions as to the reason for this latter effect without further investigation of the theme as there is no further information to suggest what would make the more affected women feel that any of the agents know more. In terms of ability to protect own and others' property it is possible that this reflects a cultural tendency observed whilst in Belize for the men to conduct the construction related tasks, rather than an actual physical ability. Interpretation of this finding is difficult without information as to how people interpret what protecting one's property actually consists of. For example, this gender difference could reflect a general tendency for the women to feel more vulnerable than the men in keeping their property safe, or simply a tendency for them not to be directly involved in protecting houses from EWEs.

On a similar theme, the more affected group showed a slightly higher level of perceived responsibility for protecting their own property and yet no difference in ability. This may be because the experience of property damage has not increased their feeling of efficacy, but has taught them that it is prudent for them to take action themselves rather than wait for others to do it for them.

The only other effect for prior experience was in relation to decision making style and this showed that the more affected were more likely to display a vigilant style and less likely one of buck passing. This is very difficult to interpret as the decision making style model is designed to reflect trait tendencies and as such should not theoretically be affected by prior experience.

The trust section shows some interesting differences between the types of trust and how they are assigned to the different agents. Of particular note

was the fact that local community figures were consistently scored the lowest across the items in this section. As discussed in the UK chapter, it is possible that this is viewed by participants as a rather ambiguous concept and therefore is not given as much attention as other items. It is also possible that in Belize, those with influence at community level are not seen to be contributing effectively towards managing the risks of EWEs. The theme of decreasing community cohesion was certainly a frequently apparent one during the time spent in the various communities and is discussed in more detail in the next section.

Scientists and media are attributed with higher levels of knowledge and accuracy of information, but not interests at heart and capacity to manage and it is interesting again that the link between these elements of trust is not as clear as might have been imagined. The national government are credited with the highest capacity to manage the risks associated with EWEs but this score is not greater by a particularly large amount. It is not clear what factors are believed to contribute to this capacity as the data suggest that it is not due to an ability to give accurate information, to high levels of knowledge or to having the people's interests at heart. The fact that friends and family are rated highly on having people's interests at heart is not surprising given that they share the closest relationships with participants and the fact that this does not stretch to the belief that they know more, have accurate information or the capacity to manage is largely due to the fact that this would normally been seen as the role of government and authority figures more than ordinary citizens. Further investigation into the complexity of trust, its elements and their relationships to each other and to other themes in the management of the risks of EWEs would clearly be of value and these findings are useful for pointing the way more clearly as to how this may best be done.

This discussion has, as previously explained, been intentionally limited so as to avoid unnecessary repetition of data and conclusions. The following section goes on to examine some of the themes identified as being of particular importance within Belize through the presentation of field notes and interviews collected in two particular communities. The current data set will then be returned to and examined in greater detail in the next chapter in relation to the UK data set.

Chapter Six

Belize Hurricane Risk Part II

Qualitative Results

Two separate visits to each community (Gales Point/Mullins River and Sarteneja) were required due to continuing heavy rain and logistical difficulties, but a total of 4 days was spent in each location. Semi-structured interviews were conducted and selected quotations are provided to illustrate points along with observational field notes, plus notes made from casual conversations with a number of residents. It was decided not to conduct a formal data analysis of the interviews as there were a number of weaknesses in the collection of these data. Instead, they are used to illustrate points identified from both the quantitative data presented already and the ethnographic field notes summarised below.

Based on a combination of initial conversations held in Gales Point during the first visit, ideas formed through the literature and the meetings with disaster management professionals, and the concerns of NEMO in Belize, a list of questions was drawn up in order to conduct a number of semi-structured interviews both in Gales Point and in Sarteneja. The initial intention had been to add a qualitative analysis to this results section with full coding of the transcripts. In reality, however, there were a number of constraints that led to the interviews being held in circumstances that were far from consistent. For example, there was no location available in the village to conduct interviews in private and as a consequence, family members and friends had tendency to want to join the conversation. This meant that on more than one occasion the interviews became more like a focus group and the decision made at the time was to go with this rather than impose rigid rules in a process that was clearly more valuable when allowed to evolve more freely. In addition, some of the interviewees did not respond especially freely to the format of the interviewing,

but were far more forthcoming when the interview was able to become more of a casual conversation. The method of recording the interviews was a small hand held digital voice recorder and there was almost always a high level of background noise whether inside or out and this has led to the loss of some of the data.

The guide questions for the interviews were as follows:

Background information:

1. Demographic information limited only to age and time lived in the village.
2. What EWEs have you experienced during your time here in (name of village)?

Main themes:

3. Who do think should be responsible for protecting this community from EWEs?
4. For you personally, what is the most important thing that you would want to keep safe in an EWE?
5. Where would you most want to be when you know that there is an EWE coming and why?
6. How has your experience of TS Arthur affected how you feel about EWEs?
7. What worries you the most about EWEs?
8. What do you think you personally have to offer your community when it comes to dealing with EWEs? (preparing and responding).
9. What do you think makes a 'disaster resilient community' (explanation of concept offered first)? Why?
10. How much do you think you have of that here?
11. What would you like to have that you don't have now, if you knew that another EWE was on the way?

12. Who do you currently trust the most to protect you from EWEs?

13. If you could give your government ONE piece of advice on how to help you deal with EWEs, what would it be?

14. How much do you personally rely on traditional knowledge and methods in dealing with EWEs?

15. Is there anything else you would like to tell me about your thoughts and experiences relating to EWEs?

The process of information gathering and data collection in Belize was to a certain extent cyclical in that conversations during the first visit, often in response to the questionnaire survey content, shaped some of the questions included in the above list, and at the same time conversations held on the second visit and quotations extracted from the recordings both reinforce and illustrate themes brought out by the quantitative data analysis. The second field trip also identified new themes not covered in the survey questionnaire. These will also be presented in the discussion section.

The findings from the combination of interviews, conversations and observations are presented below by community.

1. Gales Point and Mullins River

Gales Point is in Belize District, 30km to the south west of Belize City. Belize City is the most densely populated city in Belize (estimated population 59,400) but no longer the administrative capital since it was decimated by Hurricane Hattie in 1961, so the capital moved inland to Belmopan out of the reach of the full force of hurricanes as they make landfall. Thirty kilometres to the south of Gales Point is the town of Dangriga (estimated population 10,400). Dangriga is the centre of the Garifuna culture (descended from Caribs from South America and African slaves) in Belize and is the nearest commercial centre to Gales Point.

The population of Gales Point is approximately 250, which can swell to up to about 450 on a seasonal basis. The villagers are mostly Creole, of mixed African descent after slaves came to the area with the logging industry and then settled. Currently, the main industries in the village area are subsistence hunting, fishing, farming and tourism (Gales Point Community Development Plan, 2008). But, despite its relatively short distance from Belize City, the village is in a very isolated position. It sits on a spit of land extending into a fresh water lagoon, with only one road (a dirt track) entering the village from the south. This road crosses a river approximately 1km to the south of the village and this bridge was washed away during TS Arthur in June 2008. Several temporary structures were built in lieu of a more permanent rebuild, but by the time of return in September all of these structures had been washed away, cutting off access to the village from the south of the country including the closest large town, Dangriga. Currently, only one of the teachers in the village school live in Gales Point and the others travel in daily from Dangriga, so the lack of road access also meant that the school was forced to close as teachers could not get to work. Road access was possible from the 'Coastal Highway' which comes from the north and joins the access road to the north of the river. This meant that access from the north of the country was possible, but nonetheless this road is not paved, was in very bad condition and was frequently flooded. Travel was not possible on this route on several occasions, even in a 4x4 vehicle and therefore a number of visits had to be postponed. Only 19% of residents of Gales Point have cars (Gales Point Community Development Plan, 2008), and a bus service which would usually be available to Belize City twice weekly had stopped running since TS Arthur. This placed significant constraints on supplies being brought in and also tourists who provide much of the income for the village. Also, residents were unable to travel for important medical appointments and there is a growing concern about health care for the elderly. On both visits, bottled drinking water was running low because the trucks bringing supplies from Dangriga could not get in to the village. "...there has been the problems posed during hurricanes in which there is no access to drinkable water. During past hurricanes our community suffered dearly and it has only been recently that provisions were made through the Red Cross to secure water tanks for us to use in times of emergency. These have been strategically placed near the

two hurricane shelters, the community center and Gales Point Methodist School." (Hoare, 2002, p.15).

This was also the case for fresh produce not able to be grown or caught in the immediate vicinity. For example, in Belize the trade in chickens, a staple part of the diet for most people, is dominated by the Mennonite people, a farming population of German descent who have perfected practices that result in cheaper meat that other Belizeans have not been able to rival. For this reason it is not, according to the villagers, economically viable to keep their own chickens in the village as it would be more expensive than buying them straight from the Mennonites. This becomes a problem, however, when access to the village is restricted and they are unable to provide the required resources within their own community.

> *"I think we need good transportation by sea to Gales Point, because of our trade, maybe. You have a coupla days rain maybe and you can't go by road and maybe I want to go tomorrow and I can't go...but if you have a boat you could, but not everybody have a boat". Jewellery maker, Gales Point*

A community development plan conducted by Wildtracks a few months before my visit (Gales Point Community Development Plan, 2008) had identified a series of development issues which contribute to the context in which and are bound to impact on how residents form their opinions about and respond to extreme weather events. 96% of the residents took part in the survey and 100% of these agreed with the following Vision Statement:

"A safe, strong, unified community, maintaining its cultural traditions, with a better education, improved access and communications and more job opportunities, and community participation in decision-making and natural resource management".

From this, a number of primary objectives were generated:

1. To halt the current decline in the Gales Point community.

2. To rejuvenate and strengthen the community spirit that used to hold the community together.
3. To increase opportunities for housing, employment and education.
4. To improve access to health services.
5. To reduce crime within the community.
6. To increase community participation in decision-making and natural resource management.

The development plan includes a SWOT (strengths, weaknesses, opportunities and threats) analysis and the hurricane threat is included in the threat section, but unlike other identified threats it is not elaborated upon.

My experiences and the information I gathered reinforced that Gales Point is a village much in need of development for a number of reasons. Its geographical location lends itself towards physical isolation from the rest of Belize and in addition to this many of the villagers report a breakdown in unity within the village. Opinions on the reasons for this include lack of respect for the wisdom of elders, an increasing sense of entitlement within the younger generations (exacerbated by increased access to television and media, often from the USA) and a growing drug problem. In 1993 a large haul of cocaine was found washed up on a beach close to the village, much of which was sold on, but inevitably not all. The drugs are assumed to have come from a ship trafficking the narcotics through the Caribbean Sea and compromised in some way, leading to a 25kg load being thrown overboard. Since the early 90s there have been increasing incidents of petty crime and drug addiction within the community. At one stage, there were Peace Corps volunteers living and working with the community but after a shooting between members of rival gangs within the village, the volunteers were withdrawn. It was explained to me that the development plan is seen as a valuable undertaking by all involved but, as yet, there is no-one available to support its practical implementation.

Many villagers have also now migrated away to work in other countries, often the USA. This brings significant contributions to family incomes, but also

many stories of a life of greater freedom and material wealth; "with the influx of funds from the United States, there has also been a shift from the previous self-sufficiency of farming, fishing and hunting with expectations of the younger generation being much higher than those of their parents. Job opportunities in adjacent farming operations are therefore taken by Central American immigrants, less reluctant to work for the lower pay. Coupled with increasing drug use, the high unemployment has led to problems of increasing crime within the community." (Community Development Plan, 2008, p.20).

Houses in the village are almost exclusively made from wood, despite the acknowledgement that concrete is a much more suitable material in the face of the hurricane threat. "Whilst concrete is considered nationally as the building material of choice in coastal areas, with the ever present threat of hurricanes, the majority of houses in Gales Point have wooden walls (80%, windows (76%) and floors (67%), with zinc roofing (96%) (p.12). The reasons for this are mostly economic, but also based partially in the tradition of small wooden houses with separate kitchen outhouses which can easily be rebuilt. Demographic statistics collected for the development plan in October 2007 show that out of a total of 78 houses in the village, 51 were occupied and the other 27 were shuttered and therefore indicated seasonal occupancy. A further 18 were derelict. The average number of inhabitants per household was 4.4, with a minimum of 1 and a maximum of 13. The average number of adults was 2.3 and the average number of children 2.1. Most households have a television (71%), stereo system (73%) and a fridge (71%).

There are two concrete hurricane shelters in the village, but both are deemed unsuitable by many of the residents due to their locations, a concern that was greatly heightened by the experiences of TS (Tropical Storm) Arthur. This storm had caused flooding only, rather than wind damage and it had been noticed that both shelters are in locations where extensive flooding occurred and that they would be far more effective if located on higher ground.

> *"We need a good shelter and a nice place to stay, a nice house, 'cause the last time the rain came quick...I don't want to wake up in the night and get wet" 42 year old woman, Gales Point.*

Also, despite a strong historical reliance on fishing in the lagoon, only 29% of residents have boats with outboard motors. This was pointed out by the residents themselves as a major limitation in the ability to evacuate when the road access is compromised, especially seeing as the village is surrounded by water on three sides. There were many elements of the experiences of TS Arthur that appear to have caused a dramatic re-evaluation of the risks posed by extreme weather events, the most evidence of which is the effect of uncertainty caused by what used to be a known threat, i.e. hurricanes producing high winds and tidal surge as the main hazards, suddenly impacting on them in new and totally unexpected ways in the form of a tropical storm that produced relatively little wind and tidal surge hazard but caused a sudden and dramatic water level rise that put large parts of the village under water without warning in the middle of the night. This theme of shock, the need to re-evaluate the risk and the new uncertainty was a strong theme throughout my research and will be returned to in more detail later.

> *"One of the biggest experiences I ever get in the whole of my life". 63 year old man, Gales Point, talking about TS Arthur, having been through two hurricanes previous to this.*

Close to Gales Point there is another smaller and even more isolated community named Mullins River, to the south west of Gales Point and on the coast. This community relies also on very traditional methods of generating income and has close ties with the villagers at Gales Point through a system of exchange of goods and services. For this reason access was able to be gained to this community and further interviews be conducted by providing a vehicle to take goods in return for a guide who was able to provide introductions to the community members.

"In all my life, I am 73 years old, I have never experienced anything like this before." 73 year old woman, Mullins River. She had experienced four hurricanes before TS Arthur.

During TS Arthur both of these villages were significantly affected but in very different ways for a number of reasons. Gales Point's position on a spit of land in a still water lagoon, with land and mangrove swamps separating the lagoon from the sea, gives it a reasonable degree of protection both from the tidal surge associated with hurricanes and tropical storms and the flash flooding associated with bodies of moving water. Its major physical vulnerabilities come from rising water levels in the lagoon and limited road access in and out of the village. Both of these vulnerabilities became a reality during TS Arthur. Mullins River, by contrast, is spread over a larger section of land, but is located on the coast and next to a river and is therefore susceptible to both tidal surge and flash flooding, the latter of which had caught them out in the middle of the night when TS Arthur hit. Being able to gather experiences, attitudes and beliefs of both these communities given the cultural closeness and yet contrasting types of hazard experience provided a very valuable sample.

"The worst that we had is that last one in that come in June..and that's the first time in my years here I have seen that magnitude of flooding" 53 year old man, Mullins river

The information offered to me during more casual interactions with the villagers proved in many cases to be richer in content than much of the more structured data analysis and the themes that emerged are backed up by responses in the interviews more than the other way around. For this reason, the following section will be an overview of the main themes identified in from the field notes I took whilst I was around the villages as it was at these times that the information was the most freely forthcoming.

Shelters and evacuation:

Preferences on whether to stay in their village or evacuate inland were mixed, but there was a tendency in Gales Point more than in Mullins River for people to want to stay in the village if they felt that the shelters were adequate. Almost everyone said that if they could have one thing to help them to be safer from EWEs then it would be a good shelter and/or a stronger house. The remainder opted for better transportation but this choice was far less common.

> *"We need a good shelter and a nice place to stay, a nice house, 'cause the last time that lot of rain came quick...I don't want to wake up in the night and get wet." 42 year old woman, Gales Point.*

Many people really want to stay in the village if possible, but some fear looting, do not trust evacuation locations and feel disempowered. They often said that if they had better shelters they would be keener to stay. The current shelters are made from concrete and are felt to be structurally sound, but the locations were not felt to be suitable especially after the flooding caused during TS Arthur because in Gales Point, they are not situated on high ground. This ties in with the changes in perspective since the experiences of TS Arthur as many said that they would now respond differently to warnings than they would have done in the past. They also pointed out that for TS Arthur, unlike the hurricanes that had hit the area in the past, there was no warning of the extent of the rainfall and therefore of the devastating and rapid flooding that occurred as a result.

> *"I tell you, when I hear a warning I'm going." 63 year old man, Gales Point*

Sometimes though, the wish to stay in the village was not so much to do with immediate safety, but longer term considerations like the ability to return once the danger has passed. It was clear throughout the conversations that intended actions were taking into consideration many more factors than purely the immediate safety of self and family.

> *"I prefer to stay here...because sometimes you come out of the village and then you can't come back in. Like now where the bridge washed away." 42 year old woman, Gales Point.*

In Mullins River, though, there was more of a mixed reaction to staying or going, with some saying that regardless of the shelters, they would rather move out. Here, there were more people with family living inland and this was clearly an important factor in evacuation preferences.

> *"With the floods, yeah, because we can take care of each other...hurricane, no, with a hurricane we have to leave" 53 year old man, Mullins River, in response to whether he would prefer to stay in the village when he hears a warning.*

> *"You just have to move out and go to higher ground." 73 year old woman, Mullins River.*

For some of the residents in Mullins River the choice was a compromise of moving and staying. Their houses sit away from the main village on the beach and are therefore in the direct path of a storm making landfall on that stretch of coast. For these people, staying put is not an option and they all said they would move, but only to the shelter in the village that many of the residents there did not feel was adequate.

> *"We need to get out of here when the weather is coming...I go to the village, I never could go anywhere else." 73 year old woman, Mullins River.*

The shelter in Mullins River is on open grassland in the centre of the village and whilst it is made from concrete, it is old and in an exposed position. So, many of the residents said that it is good to have a shelter and that they have used it in the past, but that now they are starting to prefer to leave the village and keep the shelter as a last resort.

> *"If a hurricane come, we have to leave." 53 year old man, Mullins River.*

> *"I'm going to leave the village and go out, maybe Belmopan." 42 year old man, Mullins River, when asked what he will do next time there is a warning.*

As well as the need for stronger houses and more suitable shelters, members of both communities identified a need for better transportation. Rather than wishing for cars, however, they said they would like boats. In Gales Point, this is unsurprising given that the village is surrounded by water on three sides and has only on road in. In Mullins River, the wish for more boats was based directly on their experiences during TS Arthur. The road leading along the coast from the main village to the houses on the beach was washed away to such an extent that it is impassable by car or even bicycle and can only be used on foot. Also, when the flood water came without warning in the middle of the night, one resident with a canoe carried many people to safety.

> *"A good boat. No good for a hurricane but good for flooding". 53 year old man, Mullins River, when asked what he would like to help keep himself safe.*

The degree to which the sudden flooding in the middle of the night caused by TS Arthur in June 2008 has been covered for the most part in other sections. They were more put out by TS Arthur than by previous hurricanes because of the extreme volume of precipitation and the power it wielded and this seemed to have led to it being perceived as a totally new type of threat rather than the known risks associated with hurricanes. The residents said that they were accustomed to the risks posed every hurricane season and felt that on the whole, whilst they would prefer better shelters and more assistance with evacuation when it was necessary, the fact that the threat was a known one reduced the level of fear they felt. In Gales Point, residents pointed out that they were protected by the land barrier and mangrove swamps between the village and the open sea and were safer in a still water lagoon than close to a moving body of water like in Mullins River. They also pointed out that they are careful with land clearing practices. They cultivate crops on land away from the village and they do not clear the sections of land close the water's edge. They did not believe this to be the case further inland in areas that they would be asked to evacuate to, and believed that this may heighten the risks of flash flooding. The key theme that came across here was that of 'better the devil you know' and this has been reinforced throughout my research in different countries and across different hazards. The experience of TS Arthur, however, had unsettled most of them far more than the experiences they had had of hurricanes.

> *"That night was a mad night." 38 year old man, Mullins River.*

> *"I don't like to have another one like that." 42 year old man, Mullins River.*

Most of the people I spoke to had experienced Hurricane Greta (1978) and were far more upset by the recent flooding than by hurricanes, that they often refer to as 'the breeze'. When asked what elements of a hurricane they fear the most, the majority said it was the water.

> *"...because the water, you don't know what height...the speed of the water...maybe 65 mph water." 38 year old man, Mullins River.*

> *"When the breeze get up it's the noise...and then they forget about the water, you know." 73 year old woman, Mullins River.*

It is important to note that this was not exclusively the case though, and some still said that they felt that flooding was more manageable than hurricanes, even when the events that they had experienced had been the same.

> *"If the flood comes we can get to high ground but if the hurricane comes, that's the worst." 42 year old woman, Gales Point.*

Community Cohesion

Some villagers aspired primarily to self-sufficiency and feel that they have most of the resources they need with only a little help required from outside. They have fish, crops and willing people.

> *"I think the village ought to try and look after itself." 63 year old man, Gales Point*

Others felt that they were more in need of outside assistance.

> *"For the first couple, let me say maybe five years, we really tried to take care of ourselves. After that...then we have to depend on the government." 52 year old man, Mullins River.*

Life in Gales Point has at least the outward appearance of being very laid back. The villagers demonstrated a great faith in the newly elected government and so far believed that they will deliver on their promises. There was also much evidence of a strong bond to the physical place and said that they love their village and want to make it better so they can stay put. Also community cohesion, despite being a strong point of concern in terms of village development, was clearly seen as extremely important in dealing with EWEs.

> *"We got to work together." 42 year old woman, Gales Point.*

> *"If you go out there and ask them, I think everybody should come together." 42 year old woman, Gales Point*

> *"At a time like that you've got to get together, 'cause we are in pain them times, we got to get tight, to help each other, whatever we got we got to share...that's a community, you got to be. If not, we fall apart." 63 year old man, Gales Point.*

> *"To get together like a chain, a link, don't go from each other...get together and get tight, don't fall, go tight, don't fall, the tighter you get the link..." 42 year old man, Mullins River, when asked what is important in a community in relation to dealing with EWEs. He has experienced three hurricanes (Greta (1978), Mitch (1998) and Iris (2001)) before TS Arthur.*

Who would you trust the most if you knew more bad weather was coming?:

"Everybody." Same man as above.

"Because all of us are one." 53 year old man, Mullins River, when asked why it is important to him that the villagers all evacuate together.

Religion

There is a strong belief in the community in God's will and a faith that all will be well in the end as long as they all keep believing.

"I trust God." 38 year old man, Mullins River

One villager offered himself as a volunteer guide and assistant and was keen to give his perspective on the village and the issues examined in this study. He grew up in the village but then lived for several years in Belize City as a member of a drug dealing gang. He came back to the village to get away from the dangers of gang life and to settle down and now makes a living through a combination of hunting, fishing and making crafts from locally gathered materials. He has a partner and two young children and says that he would now not want to live anywhere else. He perceives this village as less risky than elsewhere in Belize, including Belmopan and San Ignacio where villagers are encouraged to evacuate to when there is a hurricane threat, because of agricultural practices such as tree clearing, and the risk of flash floods, which he sees as linked. He believes that ultimately they will be kept safe by God but he also believes it is important for the village to pull together and work as a cohesive unit.

The same villager described above also displayed a strong belief in traditional knowledge. He said that he would prefer to rely on it more than technology because he trusts it more and because it does not require equipment (e.g. television, radios etc.) He said that he prefers to rely on his own knowledge of the land and the weather that he has developed through fishing and hunting. He believes that people here prefer to stay with what is familiar even if it is more risky, and that people here would prefer to make the village safer than move inland even if the government provides buses to evacuate. They need things like shelters for animals because at the moment people have to leave them behind and go.

> *"Even the ants can tell us that bad weather is coming. They move a lot to higher ground." 42 year old man, Mullins River*

> *"The animals...make a lot of noise." 63 year old man, Gales Point.*

> *"We have to be the ones to see when we have to stay and when we have to go." 53 year old man, Mullins River.*

As outlined above, many of the villagers feel that they have a good knowledge of the weather and the land and feel that they know when action is needed, but simply lack the resources to be able to keep themselves safe within the village location. Many of the villagers are subsistence farmers, fishermen or hunters and have years of experience of reading the signs available to them in the immediate environment.

General Attitudes

> *"I always try and think something positive". 38 year old man, Mullins River. He has experienced Hurricane Greta (1978) and TS Arthur.*

A second villager also helped out as a guide and source of practical information and support. He is a jewellery maker by trade and has lived in the village all of his life. He has a very positive attitude and thinks that everything is for the good in the end and that God has a bigger plan that is not always clear in the immediate context. He pointed out that the land on his farm exposed by the recent flooding leads to better soil for organic farming and that the spoilt crops, like plantain, was good for feeding pigs. This tendency to look for the good out of difficult and testing events was apparent throughout the time in Gales Point.

2. *Sarteneja*

Sarteneja is a coastal village in North-eastern Belize. The population of around 1800 people is predominantly Mestizo (mixed Mayan and Hispanic descent) and Hispanic with a small Chinese population. The village was destroyed almost entirely by Hurricane Janet in 1955. Then, the houses were thatched and almost all blew away. Unlike further south (e.g. Gales Point and Mullins River), most houses are now made from concrete as a direct result of the devastation caused by this hurricane. Some old style houses still remain at the back of the village away from the risk of storm surge. The industry in the past has been mostly farming and then fishing but both of these are on the decline now, in the case of the latter this is due to over fishing. Now, there is still some fishing and the newly emerging industry is tourism, but not many tourists

are coming through these days due to a combination of poor access and poor marketing.

During the field visit, weather conditions were very poor and frequent heavy rainfall was a constraint in spending time in Sarteneja due to the fact that road access is via poorly surfaced jungle tracks which become frequently impassable. As a result, it was only possible to spend two days there at a time over two visits and this did not allow for relationships to be developed to the same degree as in Gales Point. Also, Sarteneja is a much bigger town and therefore communication as to my identity and purpose was not so easy and quick. As a result, many opportunistic conversations were possible with villagers who were glad of the chance to air their views but it was not so easy to set up interviews and as a result the sample here was extremely small and consisted of only three interviews and one focus group. The focus group was held predominantly in Spanish and therefore direct quotations are only possible from the volunteer translator as it was clear that at times he was having to summarise and to paraphrase. For this reason, unlike in the previous section, individuals' details cannot be provided in the quotation boxes. All of these factors mean that the evidence available for the views of the people of Sarteneja is much thinner and there is therefore more emphasis on observations and field notes for this location.

Field notes

As in Gales Point and Mullins River, the links between disaster and development are very strong here. It was pointed out by a number of people that the middle income status of Belize means that less aid comes in from outside than for other countries in Central America when extreme weather events occur.

Also in common with the villages further south was the perceived breakdown of social responsibility compared with levels in the past. One story was offered of a local who, having been given the task of distributing aid within the village, gave it to his family after telling other villagers that there was none

left. Village unity was not generally felt to be as good as in the past and some of the reasons offered were political corruption and lack of respect from the younger generation. It was felt that there was recent evidence of the lack of co-operation in the response to Hurricane Dean the previous year in terms of the distribution of food aid. There was also, as in other places, still quite a strong emphasis on traditional knowledge and a strong wish to stay in the village even when the threat is high, but they (again like Gales Point) would like a better shelter than they have now. The current official shelter is the school building and the locals told me that it shook violently during Hurricane Dean and did not feel safe to them, so they said that they would be more likely to go to houses in the rear part of the village even though they know that they are not as safe there as they would be in a proper shelter.

Some people think that tourism is the only way for Sarteneja to develop and bring in a decent income these days, but nothing is being done towards this by the government as far as they are concerned. The general feel from the people here was that they were all very hardworking and this felt like a cultural difference with the other villages in that further south the atmosphere was felt to be more one of relaxing and making a living where and when the opportunity arises. This is not to take away from the strongly stated wish to create a better life for themselves within the village rather than to rely on the emergency response of the government in relation to hurricanes, but only that the general work ethic was quite distinct. In Sarteneja, for example, help was offered freely rather than in exchange for agreeing to, for example, buy their goods or offer transportation in return for assistance. These agreements were entirely fair and worked very well in Gales Point, but it was a contrast in Sarteneja to be offered the same assistance but to have any offer of reciprocation or remuneration refused. The reception received as a rare foreigner in the village was without exception warm and helpful. And there was a genuine interest in sharing knowledge and offering experiences and opinions. In many cases, like in Gales Point, the women were more reticent than the men to talk initially, but in the focus group a number of them became much more willing to engage as they seemed much more comfortable there than in a one-to-one interaction.

In terms of local politics, a village council runs things now but some of the older people said that they think it was better when people just worked together without this imposed mechanisms.

Evacuations are offered for hurricanes, but only in the form of transport out of the village. No food, accommodation or return transport are offered so many people say that this is the reason that they would choose to stay in the village and risk the consequences. In the past, some have had to hitch rides back to the village on the back of sugar cane trucks and others have found other difficulties in returning home.

> *"I will never come out again because the last time I come out, to come back it was very difficult because the road was running with water"*

In the village, those with stronger houses often take others in for the duration of the threat.

> *"Most of the people they don't stay here in the middle of the village, they go to the stronger houses"*

People reported a tendency to prefer familiarity over safety if both could not be achieved together. They would prefer to stay in the village than leave into the unknown, even if the threat of a direct hit was high. For this reason they would prefer a better shelter rather than better evacuation conditions if they had a choice.

> *"Nobody want to stay out of their home"*

It seemed that the preference to stay was pretty much universal but there were also those who accepted that it may be necessary to leave if the danger became very high.

> *"For me I prefer to be here but if I can't I'll go"*

In terms of the different types of hazard associated with hurricanes and tropical storms, there was more of a fear expressed about tidal surge than about the wind or rainfall. This is because historically waves have caused the most damage in this location. Interestingly though, there was more concern about rivers than even the sea despite the majority of past damage being caused by tidal surge.

> *"The sea isn't that dangerous but the river is one that worries the most"*

> *"The river is worse than the sea"*

This is very similar to the concern expressed in Gales Point and Mullins River, based both on stories they had heard and on their own experience of TS Arthur, that moving bodies of water are more of a threat than the sea or lagoon because of the speed that flash flooding engulf everything and also the force of water moving at high speed. The contrasting experiences of Gales Point, where the water rose very fast but was from the lagoon and therefore not moving, compared to Mullins River where the river swept people and belongings away, led people in Gales Point to feel that they were safer in the lagoon than near a river. Here in Sarteneja it makes sense that views were more mixed about the relative danger of rivers versus the sea as past experience has shown them that

both rivers and tidal surge can result in very fast moving and powerful bodies of water engulfing them and their properties in a very short space of time.

Prior experience came across as a really important factor in people's attitudes and intended future response to EWEs, but according to the older generations, even Hurricane Dean does not seem to have had a strong impact on the younger generation's apathy. The belief was expressed that the younger generation would rather trust the information give on The Weather Channel and over the internet than by the older people in the village. Younger people were observed going down to the waterfront as Hurricane Dean was approaching. Older people believe this is because of a lack of experience and a lack of respect for the power of nature and of the warnings provided both by the authorities and by older villagers. They expressed the belief that the only thing that will change these attitudes is direct negative experiences and that not even education will work. One person suggested that the only type of education that may be effective would be physical experiences such as simulated winds of hurricane strength or being submerged under water for periods of time. This would of course be very difficult to implement for ethical reasons!

Many of the older people expressed strong disillusionment with changes in the village, including lack of respect for people and nature, and their village and culture. These older people displayed a great respect for the power of nature and the weather, based both on their own personal experience and the word of village elders.

> *"I would trust no-one, I would prepare myself"*

Villagers also felt that warnings for Hurricane Dean were more extreme than they needed to be and that this reinforced the idea in young people that there is no need to worry and hurricanes are not that bad.

Also according to people in this community, NEMO does not offer aids to preparedness such as food supplies and ensuring that shelters and adequate

and that instead they focus on response. Other than an information campaign, individuals and households are expected to be responsible for their own preparedness.

In general, as in Gales Point and Mullins River, the attitudes of the people of Sarteneja leant heavily towards a wish for self reliance at community level and for a recovery of community spirit. There were some clear cultural differences such as work ethic and the fact that here the men were seen as heads of households whereas in the other villages it was most definitely the women, but in relation to the management of hurricane risk the views that were expressed most strongly were broadly the same. There was a strong wish to have an adequate shelter within the village so that they did not need to evacuate and a willingness to work to achieve this if the resources could be made available to them. There was also a strong feeling that the culture had changed for the worse and that community cohesion and respect for local knowledge had suffered as a result. There was also an acknowledgement of the need to develop better ways to bring income into the area as historical methods, in this case fishing, were no longer a viable source in the longer term.

San Pedro

San Pedro is the largest island on the Belizean Cays, the next largest coral reef after the Great Barrier Reef off the coast of Queensland, Australia. It has a population of around 12,000, of which approximately 2500 are original occupants of the island and approximately 9500 are more recent arrivals since the development of the tourist industry. For this reason, the island is predominantly inhabited by tourists throughout the year (the climate is tropical and therefore warm all year around) and those providing services for the tourist industry. Its location out in the Caribbean Sea makes it physically very vulnerable to hurricanes and tropical storms as there is no other land mass to shield it from the force of first landfall. Economically, however, San Pedro is much stronger than the rest of Belize as it has a year round influx of international tourists who come for the diving and to relax on its pristine white beaches.

The opportunity arose to interview a local community figure on the island that has not only a significant current role in hurricane preparedness but also a long historical involvement in the development of mitigation and response plans at both a local and national level.

He had previously served in the British Army and a posting had first brought him to the country. He left the army as a Sergeant in 1985, decided to make Belize his home and chose the island of San Pedro. Through his previous military roles he was knowledgeable about local politics and especially about emergency response issues, was well connected with the authorities and was known by decision makers up to national level. At this stage there was no formal hurricane plan for the town council at all and this was still the case by 1989. He was on the town board at this time and was therefore asked to help formulate a plan. He had been a liaison for San Ignacio town and BFB during his time in the British Army and new a lot about the issues involved. He wrote a plan and it was shelved until Hurricane Mitch (1998) and the Prime Minister contacted him and out him in charge of San Pedro hurricane response, especially evacuation. His experience of this event was that people did not listen to warnings at first, did not believe it was coming, but then panicked when it became apparent that there really was a hurricane almost upon them. Older islanders did not want to leave the island and only tourists and workers were willing to evacuate. Eventually, 9760 people were evacuated, but there are around 2500 original locals who he says will never evacuate regardless of the level of threat posed by an approaching hurricane. There have never been mandatory evacuations and he believes that for cultural reasons they would not work even if introduced. He believed these feelings to be so strong that such a move would prove so unpopular as to put the government's re-election chances at risk.

Because so many of the people living and working on San Pedro are not originally from the island, many are able to evacuate to family and friends back on the mainland. For this reason, hurricane shelters have never reached capacity. It is therefore not a priority to improve shelters on the island, unlike in locations on the mainland, and so it is necessary to have very different plans in place in different parts of the country despite how small the country is. In his opinion, the shelters on San Pedro are for 'procrastinators and bums'. They are

intentionally only opened at the last minute so as to make it more difficult to stay on the island rather than to evacuate.

A further view was that everyone wants someone else to pay for evacuation, but in reality the residents need to pay for themselves. He believes that it is necessary to be 'callous about transportation' to encourage people to take responsibility for their own safety and that it is therefore not provided for free. This would be a very interesting research question in terms of investigating the degree to which this perception that lack of action is brought about by laziness and the extent to which current plans, based on these opinions, are effective.

There is apparently now an emerging middle class on San Pedro who are starting to prepare much more thoroughly, including buying in provisions and making arrangements with friends for transport and accommodation. There was a problem with pets, but this has recently been remedied by a charity named SAGA who takes care of people's animals. He also believes that since Hurricane Keith in 2000 people have been really scared as they have seen what a hurricane can do, so they are now quicker to do as they are told by the authorities. Despite the differences in the detail of the context, this offers further weight to the importance of the role of prior experience in shaping future attitudes and behaviours. In further support of the view that willingness to take action is changing in the light of previous events, there was a prompt and full evacuation for Hurricane Dean and then Felix was heading straight for them directly afterwards and they had to evacuate again. It is not possible to conclude from a single person's experiences that the link between prior experience and future adherence to warnings is a direct one, but it is certainly valuable to add this to the collection of observations that direct personal experience does seem to play a powerful role.

In his experience, it is leaving their homes that people find the most traumatic. They are worried about what they might come back to, not just damage from the weather, but looting by opportunists who stay behind because they know that properties will be vacant. There are now police and BDF (Belize Defence Force) patrols for this purpose on San Pedro as experience has shown

these fears to be well founded. This also provides further reinforcement of the views expressed by the villagers on the mainland.

Also in keeping with themes that were central to the concerns of the people on the mainland, he explained that, traditionally, fishermen have been very effective forecasters of the weather, but in recent years weather patterns have changed so dramatically that they no longer have confidence. They are able to read pressure changes by things like clay coming up through mud, but they are increasingly aware of climate change and feel that they can no longer rely on traditional methods in the way that they once did. They are, as a group, generally very good at taking care of themselves in relation to hurricane risk. For example they take their boats and equipment to safe places, like mangroves which provide good shelter, plenty of time in advance and do not expect help from others. This is also generally true of the tour guides. This reinforces the general wish that people have to take care of themselves and feel empowered to take action, coupled with an acknowledgement that there are increasingly external factors preventing them from doing so, whether they are lack of money and resources, problems with younger generations and cultural change, and in this case changes in the natural environment.

Another problem in relation to traditional knowledge is that on the whole, even when it is offered, locals no longer act upon it in the way that they once did because they are relying more and more on technology over and above everything else. They need to be told sometimes to listen to local authorities rather than only to The Weather Channel, another point echoed by conversations elsewhere in the country.

In summary, it is acknowledged that the value of this information is limited due to the fact that it is based solely on the opinions and experiences of one individual. It was however chosen to be included as an extra piece of evidence as to the main themes emerging in understanding better how people respond to the threat of hurricanes in Belize and why.

Throughout the various locations visited in Belize, there were themes that were repeated and these related both the attitudes towards and perceptions of the hurricanes and associated hazards themselves and the way in which the risks are managed. These themes are summarised here as the nature of this chapter has meant that the detail has been discussed as the information was presented.

On the whole, people reported a preference towards familiarity over safety, when the two were not able to be found together. In Gales Point, for example, many villagers said that whilst they were aware that the threat of tidal surge was very real, they would prefer to stay and deal with that known threat than move inland and face a host of new potential threats they were unsure about. Some interesting examples of this tendency to choose familiarity over an assessment of actual levels of risk were found whilst in communities at risk from tornadoes on the central plains of the USA. Two ladies, interviewed in different towns, had moved there from their hometowns where they had had previous experience of in one case a hurricane (n Boston, Massachusetts) and the other an earthquake (in San Francisco), California). Both said that whilst the experiences were extremely frightening and the danger very real, they would prefer to experience that type of event than a tornado purely because it was a known threat versus an unknown one. This theme was not covered in the quantitative data collection but has emerged as a strong and repeated theme in different locations around the world and as such would clearly benefit from further more systematic investigation.

Development issues also emerged as having a strong impact on hurricane preparedness, but as they are largely contextual factors they are, beyond an acknowledgement of their importance in how people feel and react, outside of the scope of this study and indeed already form a whole field of study in their own right. In Belize, it was clear that the overlap between development and hurricane preparedness is particularly large and this is also worth taking into account when comparing attitudes and beliefs with those of the UK sample. This will be covered in more detail in the next chapter.

Generational differences were highlighted in all locations as important factors in how the different age groups respond to hurricane risk. Most of the people whose views were gathered were over forty and this of course will have biased this information in favour of the concerns and perspective of the older generations, without the benefit of younger people's views to redress the balance. The generational differences expressed mainly concerned a felt breakdown in community unity and a decline in respect for elders and the wisdom they felt they had to offer and that had been transferred historically from generation to generation. Also seen as important in managing the risks of hurricanes and as a general development concern was the perceived decline in respect for the natural environment. Whilst it is clear that respect for traditional knowledge and learning to read the signs available in the natural world was clearly being replaced by reliance on the internet and television, a more broad concern for the natural environment has clearly been an issue that reaches beyond the current young generation as some of the current development problems are attributed to over hunting and over fishing spanning the past few generations.

The question of shelters versus evacuation was an extremely important one to the people in Belize. Evacuation appears to be the current preferred method of preparedness on the part of the government and this may be for a number of reasons. It may be that funding constraints have not allowed for research to be carried out in order to help to inform the government of the best ways to help the communities to keep themselves safe as there has been a more pressing need to respond to the crises brought by each new hurricane season. Indeed at the time of this study the authorities were still dealing with the aftermath of TS Arthur and only the year before they had Hurricane Dean to deal with. If this is the case then it is hoped that the current study may serve to provide some of the information that NEMO and the government have not so far had time to collect themselves. It is also of course possible that there are financial and/or political reasons for evacuation as a preferred policy. For example, it may be that transportation each time there is an elevated risk is still calculated as cheaper than constructing new shelters in the villages, or it may be the case that the government would prefer that people are not encouraged to stay as if they are killed or injured in a high risk location then the responsibility

for them staying may be laid at the government's door, or at least it may be feared that that would be the outcome. These are clearly issues that cross over into other disciplines and are again largely outside the scope of this study, but have none-the-less emerged as important themes in relation to the attitudes and behaviours of the people living with hurricane risk in Belize and as such deserve some discussion.

Prior experience remains a central theme throughout the thesis and the information presented in this section offers further confirmation of the importance of its role. The quantitative data ultimately offered only a general indication as to the impact of the level of direct personal experience on related attitudes and beliefs. Here, the information gathered is complementary to the data in that, whilst it is not possible to generalise to the same degree from individual conversations, it can nevertheless be used to develop more specific questions for future studies by narrowing down the range of possible ways in which prior experience appears to be playing a role. For example, it is possible that the people most at risk in their community may actually be the young and inexperienced more so that the old or poor, because it is the opinion of many in the older generation that they will not show attitude or behaviour change through means such as education or parental advice, but only through direct personal experience. By contrast, the poor and elderly are displaying a keenness to keep themselves safe and say that they ask only for practical assistance in order to do so. The psychological factors (rather than economic, social and political) that put people at risk may in some cases be closely related to age and experience, and this would clearly be a valuable future study.

Housing was expressed as an important concern and whilst this is probably more of an economic issue than anything else, nevertheless warrants some mention as a recurrent theme. Most houses in Sarteneja are now concrete due to the devastation caused by Hurricane Janet in 1955, which prompted the government to provide money to build more hurricane resistant ones. Further south most houses remain wooden, but many locals said that they preferred this as they were easy and cheap to rebuild if destroyed and could be rebuilt by the villagers themselves. Those with this view did not express a concern about personal safety in a wooden house as this view seemed to go hand in hand with the wish to have one hurricane proof building in

the village to go to during high alert. In Sarteneja, there was also a wish for a better shelter but this seemed diluted by the fact that they have a current system of using the houses that they deem to be both strongest and in the safest locations. On the surface this whole issue could be seen as a political and economic one, but its value to the current study is by offering further evidence, albeit anecdotal at this stage, as to how people piece together a preferred strategy based on a mixture of experience (for example finding that they had been able to rebuild a house quickly and easily in Gales Point without outside assistance), personal preferences and beliefs (like wanting to stay in their own house more than going to a communal shelter) in order to arrive at an optimum plan for themselves and their family. The issue of housing raises interesting research questions in, for example, exploring further the degree to which people prefer to stay in their own homes if they were able to feel safe, versus going to a communal shelter where they lose their familiar surroundings but for example gain the solidarity of sharing the experience with others. The varying opinions given across the locations visited in Belize and the degree to which this may be due to contextual differences, cultural differences or individual differences make it a topic ripe for further investigation.

Although the overall hazard chosen as the backdrop for this study was hurricanes, it very quickly became apparent that people do not view a hurricane as a single hazard but as a number of distinct threats in the form of wind, flooding and tidal surge for example. This is before considering the fact that for many people the biggest perceived threat is not necessarily from the natural hazard itself but from the action required of them to keep themselves safe, like to evacuate to an unfamiliar location and leave their home vulnerable, as discussed in an earlier section. So, the way in which risk is perceived and acted upon will clearly have much to do with what elements of the risk are felt to present the greatest threat. It seemed that in Belize, almost universally, the most feared threat is water. This is based on direct personal experience, such as the very recent experiences in Gales Point and Mullins River, and stories from the experience of others passed down the generations, such as those of tidal surge during Hurricane Janet in Sarteneja in 1955. The fear is generally greater of moving water (tidal surge and flash flooding) as discussed previously. This was reinforced by the fact that the people of Gales Point had very recently

had a traumatic experience of sudden and dramatic water level rise, they reported feeling luckier than their neighbours in Mullins River and down in Hope Creek, who had been subjected to flash flooding. Also, Gales Point had been protected from tidal surge in the past because of the land barrier and mangroves between the lagoon and the Caribbean Sea. The theme of hazard familiarity is repeated here as it seems that often the hazard that is felt to be the least dangerous is often the one to which people have already been exposed. Or, another possibility give the current information, is that if people prefer to stay in their own villages, then it is more comfortable to justify this choice by reducing the perceived risk of hazards in that location. This question would in itself provide a very useful and interesting study.

Critical Evaluation

For the main part, comments on limitations of the information presented in this chapter have been covered throughout. In summary, the main yet in this case unavoidable constraints were those of sample size and time spent in each location. The small amount of quantitative data collected compared to the vast amount of information gained through a qualitative research design is a valuable lesson learned in terms of considerations in designing cross-cultural research. Whilst a questionnaire survey was adequate and practical in the UK study, respondents in Belize were far more comfortable talking freely about their thoughts and experiences and much less keen to sit and complete a paper questionnaire. Due to the late decision to return to Belize and collect qualitative data, the methodology was not as rigorous as it could have otherwise been and therefore interview data were not able to be used in the manner originally intended. It is believed however that the information presented here, whilst clearly not able to be considered data as such, provides a very valuable insight into some of the complexity of attitudes and beliefs about hurricanes and how best to manage the risks they pose to the people of Belize. This section would certainly provide a valuable start point for the design of further studies focusing on issues that are more relevant in the less developed world. These could include DRR in the wider development context, the role of the traditional

knowledge in community resilience towards natural hazards and the impact of religion on attitudes towards EWEs and how best to respond to the associated risks.

Chapter Seven

Cultural Comparisons

The data sets compared in this chapter are the same ones that have been presented separately in the preceding two chapters. As explained in the introduction, there were themes that were designed to be explore in terms of their relationships within the samples and therefore within the context of a certain hazard in a certain country. These have been covered in the country-specific chapters. There was also an intention from the outset to explore themes that could be examined across different hazard types and cultural contexts and this is why the samples were chosen in locations that were both distinct in terms of the type of weather events experienced (hurricanes versus flooding) and in terms of the physical context in which the risk is affecting people. In these samples there are differences in terms of cultural, socio-economic, political and geographical factors, all of which should be apparent from the information provided in the previous chapters. The current chapter therefore seeks to focus on identifying both the similarities and the differences between the samples, both in the way that they have been affected by EWEs and in terms of the attitudes, beliefs and perceptions they hold, and the behaviours that they reportedly engage in. As discussed both in the introduction and in the Belize study chapter, the considerations required in conducting cross-cultural research are many. This chapter is designed to explore the elements of the study that may be common to human responses to disaster and risk beyond the reach of cultural and religious influences and yet at the same time ascertain which factors may be attributable to specific cultural, environmental and socio-economic contexts.

A series of multivariate analyses were therefore run on the data with 'country' as the independent variable. Results are presented below in the order of the questionnaire sections.

Table 7.1 details prior experience by hazard for the two countries.

Hazard Type	**Belize %**	**UK %**
Flooding	64	73
Hurricanes/windstorms	66	11
Drought	0	1
Heat wave	7	3
Other	0	3

Table 7.1 Prior experience percentages by country

So, both samples were affected to a similar degree by flooding and Belize also had a high count for hurricanes. Further information on the way in which the participants were affected by these events in the two countries is presented in table 7.2.

How affected	Belize %	UK %
Personal injury	4	1
Personal danger	18	7
Damage to property	57	45
Evacuation from property	45	52
Damage to workplace	29	4
Disruption to work, business, education	43	22
Disruption to transport, travel	39	32
Loss of services	46	16

Table 7.2 Prior experience percentages by type for UK and Belize

The Belize sample show greater numbers affected by all except for evacuation from property and the largest difference is for damage to workplace.

Perception of risk and beliefs about EWEs

(Items 1.1.1 to 1.1.12)

A significant multivariate effect of country was found on these items ($F(12,172)=13.18$, $p<.001$, $eta^2=.48$). Effects were on all items except 1.1.4 ($p=.28$), 1.1.6 ($p=.88$) and 1.1.11 ($p=.68$). The Belizean participants gave higher scores on all items except in believing that EWEs are becoming more difficult to predict, that there is plenty that can be done to stop the worst effects of EWEs on people and in preferring not to think about EWEs. Statistics are presented in table 7.3.

Item	Key words	F	df	P value	Eta^2	Mean UK	Mean BZE
1.1.1	More severe	20.27	1,183	<.001	.10	.96	1.54
1.1.2	More frequent in past	9.73	1,183	<.01	.05	.95	1.37
1.1.3	More frequent future	17.08	1,183	<.001	.09	.86	1.37
1.1.5	Nothing to be done	16.19	1,183	<.001	.08	.08	.80
1.1.7	People who suffer are poor	45.34	1,183	<.001	1.00	.12	1.33
1.1.8	People who suffer are least protected	37.10	1,183	<.001	1.00	-.43	.54
1.1.9	Personal risk	15.05	1,183	<.001	.97	.22	.78
1.1.10	Feeling of fear	16.70	1,183	<.001	.98	.19	.85
1.1.12	Should be prevented	23.65	1,183	<.001	1.00	.72	-.04

Table 7.3 *Multivariate statistics for country differences on perception of risk and beliefs about EWE items*

(Items coded as follows: -2=strongly disagree, -1=disagree, 0=neither agree nor disagree, 1=agree, 2=strongly agree)

Perceived personal responsibility for self, property and others

(Items 1.2.1, 1.2.3, 1.2.5, 1.2.7)

A significant multivariate effect of country was found for these items ($F(4,192)=23.52$, $p<.001$, $eta^2=.33$). Univariate effects were significant for all items in this section, with higher scores for the Belizean participants indicating that they feel more responsible than do the UK sample for protecting themselves, their properties and for helping their neighbours to protect themselves and their properties. Statistics are presented in table 7.4.

Item	Key words	F	df	P value	Eta^2	Mean UK	Mean BZE
1.2.1	For self and family	89.89	1,192	<.001	.32	.22	1.45
1.2.3	For property	33.94	1,192	<.001	.15	.10	.93
1.2.5	For neighbours	20.99	1,192	<.001	.10	-.22	.40
1.2.7	For neighbours' property	5.84	1,192	<.05	.03	-.54	-.22

Table 7.4 Multivariate statistics for country differences on perceived responsibility items

(Items coded as follows: -2=strongly disagree, -1=disagree, 0=neither agree nor disagree, 1=agree, 2=strongly agree)

Perceived personal ability to protect self, property and others

(Items 1.2.2, 1.2.4, 1.2.6, 1.2.8)

A significant multivariate effect of country was found for these items ($F(4,186)=11.11$, $p<.001$, $eta^2=.19$). Univariate effects were significant for all items in this section, with higher scores for the Belizean participants indicating that they feel more able than do the UK sample to protect themselves, their properties and to help their neighbours to protect themselves and their properties. Statistics are presented in table 7.5.

Item	Key words	F	df	P value	Eta^2	Mean UK	Mean BZE
1.2.2	For self and family	42.56	1,189	<.001	.18	-.38	.53
1.2.4	For property	13.72	1,189	<.001	.07	-.48	.07
1.2.6	For neighbours	8.55	1,189	<.01	.04	-.21	.22
1.2.8	For neighbours' property	5.18	1,189	<.05	.03	-.35	-.02

Table 7.5 Multivariate statistics for country differences of perceived ability items

(Items coded as follows: -2=strongly disagree, -1=disagree, 0=neither agree nor disagree, 1=agree, 2=strongly agree)

Perceived responsibility of others

(Items 1.3.1 to 1.3.5).

There was a significant multivariate effect of country on these items ($F(5,190)=4.81$, $p<.001$, $eta^2=.11$), with univariate differences on items 1.3.2 ($F(1,194)=10.12$, $p<.01$, $eta^2=.05$) and 1.3.5 ($F(1,194)=14.27$, $p<.001$, $eta^2=.07$). This was reflected by stronger disagreement by the Belizean sample that they should not have to take action against EWEs if others are not doing the same (M=-1.06 versus -.67 for the UK) and stronger agreement by the Belizean sample that the best way to help themselves is by helping each other (M=1.29 versus .81 for the UK). Means for each country are presented in the table 7.6.

Item	Key words	Mean UK	Mean Belize
1.3.1	No point doing anything if neighbours aren't	-.48	-.66
1.3.2	Shouldn't have to if others aren't	-.67	-1.06
1.3.3	Don't see point if don't know risks	-.26	-.35
1.3.4	Do more in neighbourhood than others	-.18	-.02
1.3.5	Best way to help ourselves is help each other	.81	1.29

Table 7.6 *Mean scores for perceived responsibility of others items by country*

(Items coded as follows: -2=strongly disagree, -1=disagree, 0=neither agree nor disagree, 1=agree, 2=strongly agree)

Relative risk

(Items 1.4 to 1.6)

There was also a significant multivariate effect of country on the relative risk items ($F(3,190)=13.25$, $p<.001$, $eta^2=.17$), with a univariate effect only on item 1.4 ($F(39.66$, $p<.001$, $eta^2=.17$). Belizeans feel that their country is more at risk than other countries (M=.52) significantly more so than do the UK participants (M=-.54). There were no significant differences on similar items that asked whether their part of the country was perceived as more at risk than other parts of the country (p=.09) and whether their home was perceived as more at risk than other homes in their neighbourhood (p=.69). Means for each country are presented in table 7.7.

Item	Key words	Mean UK	Mean Belize
1.4	More at risk than other countries	-.54	.52
1.5	More at risk than other parts of this country	.20	.45
1.6	More at risk than other homes in this neighbourhood	.09	.14

Table 7.7 Mean scores for relative risk items by country

(Items coded as follows: -2=strongly disagree, -1=disagree, 0=neither agree nor disagree, 1=agree, 2=strongly agree)

Trust

(Items 1.7 to 1.10)

A series of 2 x 2 x 5 ANOVAs were run on the trust items with repeated measures on the last factor (agent). As in the trust section of the Belize chapter, there are only five agents due to the fact that in the Belize data set there is no local government, only the national government. Trust items were coded as follows: 0=not at all, 1=a little, 2=somewhat, 3=very much.

For trust in giving accurate information, there was a significant main effect for country ($F(1,170)=30.72$, $p<.001$, $eta^2=.15$) reflecting higher overall means for Belize (M=1.84 versus 1.32 for UK) and a main effect for agent ($F(4,680)=29.68$, $p<.001$, $eta^2=.15$), reflecting particularly high scores for scientists (M=2.01) and lower scores for local community figures (M=1.12). There was also a significant agent by country interaction ($F(4,684)=4.67$, $p=.001$, $eta^2=.03$), and this was due mainly to higher scores given to the media by the Belizean sample (M=2.28 versus 1.29 for the UK). Mean scores for giving accurate information are presented in table 7.8 by agent.

Agent	**Mean UK**	**Mean Belize**	**Mean**
National Government	1.12	1.63	1.37
Scientists	1.81	2.21	2.01
Local Community Figures	.98	1.26	1.12
The Media	1.29	2.28	1.78
Friends and Family	1.42	1.84	1.63

Table 7.8 Means scores for giving accurate information

For knowing about the risks of EWEs, there was a significant main effect for country ($F(1,171)=16.56$, $p<.001$, $eta^2=.09$) reflecting higher overall means for Belize (M=1.95 versus 1.53 for UK) and a significant effect for agent ($F(4,684)=50.59$, $p<.001$, $eta^2=.23$), reflecting again high scores for scientists (M=2.35) and low scores for local community figures (M=1.35). Again, there was an effect for the agent by country interaction ($F(4,684)=5.03$, $p=.001$, $eta^2=.23$), with Belizeans giving higher scores to the media (M=2.22 versus 1.41 for the UK). Mean scores for knowledge about the risks are presented in table 7.9 by agent.

Agent	Mean UK	Mean Belize	Mean
National Government	1.70	1.89	1.79
Scientists	2.23	2.47	2.35
Local Community Figures	1.19	1.51	1.35
The Media	1.41	2.22	1.82
Friends and Family	1.13	1.67	1.40

Table 7.9 Mean scores for knowledge about the risks of EWEs

The degree to which agents are believed to have people's interests at heart again showed a significant main effect for country ($F(1,168)=17.66$, $p<.001$, $eta^2=.10$) reflecting higher overall means for Belize (M=1.83 versus 1.40 for UK) and a significant agent effect ($F(4,672)=58.20$, $p<.001$, $eta^2=.26$). In this measure, friends and family were given particularly high ratings (M=2.46) whilst local community figures were again the lowest (M=1.34). As in the previous measures, there was also a significant agent by country interaction ($F(4,672)=8.30$, $p<.001$, $eta^2=.05$) reflecting a particularly large difference in scores given to the national government (M=1.57 for Belize and .95 for UK) and the media (M=1.91 for Belize and .92 for the UK). Mean scores for having people's interests at heart are presented in table 7.10 by agent.

Agent	Mean UK	Mean Belize	Mean
National Government	.95	1.57	1.26
Scientists	1.50	1.68	1.59
Local Community Figures	1.18	1.50	1.34
The Media	.92	1.91	1.42
Friends and Family	2.43	2.50	2.46

Table 7.10 Mean scores for having people's interests at heart

Finally, for ratings of the capacity to manage EWEs there was a significant main effect for country ($F(1,171)=12.69$, $p<.001$, $eta^2=.07$) reflecting higher overall means for Belize (M=1.61 versus 1.20 for UK) and a significant agent effect ($F(4,684)=15.61$, $p<.001$, $eta^2=.08$) with higher scores for national government (M=1.77). There was, as in all other trust measures, also an agent by country interaction ($F(4,684)=7.59$, $p<.001$, $eta^2=.04$) with particular differences in this case between scores given to friends and family (M=1.61 for Belize versus .85 for the UK). Mean scores for capacity to manage are presented in the Table 7.11 by agent.

Agent	Mean UK	Mean Belize	Mean
National Government	1.65	1.89	1.77
Scientists	1.57	1.57	1.57
Local Community Figures	1.10	1.39	1.24
The Media	.83	1.61	1.22
Friends and Family	.85	1.61	1.23

Table 7.11 Mean scores for capacity to manage

Community and Place Attachment

(Items 2.3, 2.5, 2.6.1 to 2.6.11)

There was a significant effect of country for community attachment items ($F(2,195)=5.43$, $p<.01$, $eta^2=.05$), with effects on both items 2.3 ($F(1,196)=9.09$, $p<.01$, $eta^2=.04$) and 2.5 ($F(1,196)=9.42$, $p<.01$, $eta^2=.05$). This was reflected by higher mean scores for the Belize sample (M=2.34) compared with the UK (M=1.92) on the level to which they feel attached to their community and also on the level to which they feel they identify with their community (M=2.16 for Belize and M=1.73 for UK).

An ANOVA was also carried out on the combined variable of the above items, commatt, and a significant effect of country was also found for this variable ($F(1,196)=10.90$, $p=.001$, $eta^2=.05$), with the Belize sample again showing higher scores (M=2.25) than the UK sample (M=1.82).

On items 2.6.1 to 2.6.11, relating to community and place attachment issues, there was also a significant effect of country ($F(11,180)=5.30$, $p<.001$, $eta^2=.24$). Significant effects were found for 2.6.3 ($F(1,190)=25.17$, $p<.001$,

eta^2=.12), 2.6.4 (F(1,190)=11.61, p=.001, eta^2=.06) and 2.6.6 (F(1,190)=7.44, p<.01, eta^2=.04). This was again reflected in higher mean scores for the Belize sample than for the UK sample, indicating that the Belize sample think that EWEs are just something they have to put up with of they want to live where they live (BZE M=.87 and UK M=.03), that the Belize sample disagree less strongly that losing material possessions as a result of EWEs would not bother them (BZE M=-.25 and UK M=-.80) and that the Belize sample show a stronger preference for living where they live even if their property was to become at greater risk from EWEs (BZE M=.17 and UK M=-.26).

Preparedness Behaviours

(Items 3.1a to 3.1e and 3.2.1 to 3.2.5)

A series of crosstabs on behaviour items showed that there was a significant difference between countries on levels of engagement in all behaviours. Statistics are presented in Table 7.12.

Behaviour	**Chi^2**	**df**	**P value**	**% Yes UK**	**% Yes BZE**
Organise Meetings	17.68	1	<.001	6	27
Attend meetings	6.52	1	<.05	25	43
Follow recommendations	6.990	1	<.01	59	79
Construct defences	30.29	1	<.001	34	77
Campaign for action	4.67	1	<.05	11	23

Table 7.12 Statistics for country differences in reported behavioural engagement

These results show that the largest differences between the UK and Belize are for organising community meetings and constructing defences in the home.

For importance ratings for these behaviours there was also a significant effect of country ($F(5,184)=6.87$, $p<.001$, $eta^2=.16$). This was reflected in a significant difference for ratings on all behaviours except for campaigning for action by the national government ($p=.13$). Statistics are presented in Table 7.13

Behaviour	**F**	**Df**	**P value**	**Eta^2**	**Mean Importance UK**	**Mean Importance BZE**
Organise Meetings	18.34	1,188	<.001	.09	1.91	2.46
Attend meetings	20.38	1,188	<.001	.10	1.86	2.44
Follow recommendations	10.45	1,188	=.001	.05	2.14	2.54
Construct defences	19.91	1,188	<.001	.10	2.16	2.76

Table 7.13 Statistics for country differences in importance ratings for behaviours

So, the Belize sample gives significantly higher importance ratings to all of the behaviours apart from campaigning for action by the national government.

(Items 4.1, 4.2.1 to 4.2.7 and 4.3.1 to 4.3.18)

Crosstabs were also carried out on items relating to climate change beliefs. There was a significant difference between the countries on the degree to which they believe that the climate is changing as a result of human activity ($Chi^2(1)=9.73$, $p<.01$). The Belize sample has a greater number of people reporting the belief that the climate is changing as a result of human activity (82% as opposed to 59% of the UK sample).

Further analyses were run on items 4.2.1r to 4.2.7r, which asked participants to what degree they believe climate change contributed to a number of natural disasters around the world that occurred close to the time of data collection. There was no significant effect of country on these items, but the difference was close to significant ($p=.07$) and this reflects a number of significant differences on the individual items. Statistics are presented in Table 7.14.

Event	F	Df	P value	Eta^2	Mean Score UK	Mean Score BZE
Asian Tsunami	10.43	1,123	<.01	.08	1.42	2.21
Hurricane Katrina	8.26	1,123	<.01	.06	1.56	2.24
UK Floods	3.24	1,123	p=.07	.03	1.87	2.28
California Fires	8.94	1,123	<.01	.07	1.58	2.24
Mexico Floods	3.97	1,123	<.05	.03	1.69	2.14
Bangladesh Cyclone	8.36	1,123	<.01	.06	1.55	2.21
Tennessee Tornadoes	8.65	1,123	<.01	.07	1.48	2.14

Table 7.14 Statistics for country differences on contribution of climate change to selected EWEs

These scores show belief in higher levels of contribution by climate change by the Belizean sample for all events except for the UK flooding in 2007. Here, the difference is near to significant with the Belizeans again giving a higher mean score than UK participants.

For items 4.3.1 to 4.3.9, relating to a number of beliefs about climate change and its management there was again a significant effect of country ($F(9,181)=4.92$, $p<.001$, $eta^2=.20$). This was reflected in significant differences for items 4.3.2 ($F(1,189)=11.41$, $p=.001$, $eta^2=.06$), 4.3.3 ($F(1,189)=10.38$, $p=.001$, $eta^2=.05$), 4.3.5 ($F(1,189)=8.02$, $p<.01$, $eta^2=.04$) and 4.3.7 ($F(1,189)=4.91$, $p<.05$, $eta^2=.03$). The Belize sample reported stronger agreement that scientists agree that climate change is really happening (M=1.04 compared to .61 for UK), that there is nothing anyone can do to stop climate change happening (M=.09 compared to -.44 for the UK) and less

disagreement that there is no point in doing anything about climate change until they know all the facts for certain (M=-.19 compared to -.64 for UK). The Belize sample showed lower levels of agreement that there is plenty that can be done to prevent the worst effects of climate change on other species (M=.43 compared to .73 for UK).

For item 4.3.10, asking participants to rate the degree to which they think technology versus lifestyle change is important in dealing with climate change, there was no significant effect of country (p=.79).

A significant effect of country was found in measures of who is believed to be more responsible for dealing with climate change ($F(6,150)=3.90$, $p<.001$, $eta^2=.14$). This was reflected in significant differences on items 4.3.11d ($F(1,155)=12.95$, $p<.001$, $eta^2=.08$) and 4.3.11e ($F(1,155)=7.45$, $p<.01$, $eta^2=.05$). The Belize sample gave higher responsibility ratings to religious/spiritual leaders (M=12.04 compared to 3.82 for UK) and to scientists (M=22.00 compared to 13.54 for UK).

Finally on items designed to measure a number of beliefs about human relationships with the natural world, there was found to be a significant effect of country ($F(7,184)=5.64$, $p<.001$, $eta^2=.18$). Significant differences were found on items 4.3.12 ($F(1,190)=29.10$, $p<.001$, $eta^2=.13$), 4.3.15 ($F(1,190)=6.15$, $p<.05$, $eta^2=.03$), 4.3.16 ($F(1,190)=11.06$, $p=.001$, $eta^2=.06$) and 4.3.18 ($F(1,190)=4.46$, $p<.05$, $eta^2=.02$). Means for these items are presented in Table 7.15.

Item	Mean UK	Mean BZE
4.3.12	-.06	.78
4.3.15	.93	1.22
4.3.16	-.31	.18
4.3.18	.96	.66

Table 7.15 Mean scores for items on human relationships with the natural environment by country

The means show that the Belizeans tend to agree more strongly that human beings are at the mercy of the natural world, that human beings and the natural world are dependent on each other, that human beings should be able to control the natural world and that the natural world is more powerful than human beings.

Decision-making Confidence and Style

(Items 5.1 and 5.2)

There was a significant effect of country on responses to the decision making scale ($F(5,185)=2.64$, $p<.05$, $eta^2=.07$). There was no significant difference in levels of decision making confidence ($p=.72$), but there were differences for vigilant ($F(1,189)=5.07$, $p<.05$, $eta^2=.03$), buck passing ($F(1,189)=5.50$, $p<.05$, $eta^2=.03$) and hyper vigilant ($F(1,189)=4.31$, $p<.05$, $eta^2=.02$) decision making styles. Means show that Belizean respondents score more highly on all of the above styles and are presented in Table 7.16.

Decision Making Style	UK Mean	BZE Mean
Vigilance	1.52	1.66
Buck passing	.58	.74
Hyper vigilance	.70	.84

Table 7.16 Mean scores for decision making confidence and style by country

Although the difference is non-significant, Belizeans reported slightly lower levels of decision making confidence (M=1.50) than the UK sample (M=1.52) whilst on all other decision making measures the Belize scores were higher.

Discussion

As explained in the chapter introduction, the purpose of this section was to tease out both what is the same or similar across cultures, and therefore potentially more attributable to general human responses to disaster and risk, as well as what is distinct and therefore potentially attributable to the context. The main areas in which cultural differences were initially expected, based on time spent by the author in various hazard regions in culturally diverse locations, were in community cohesion and trust in the authorities. In reality though, significant differences were found throughout the study for all but a few items.

The timing of data collection had a clear impact on the number of people affected by type of EWE in that both locations had just been hit by events a short time before the questionnaires were completed. For the UK sample, this was flooding and although the design of the study was such that the intention was to collect data on different hazard types, and therefore Belize was selected as an area of high hurricane risk, the fact that TS Arthur had hit the central coast of Belize just a couple of weeks before data collection actually made the samples more comparable in the number of people affected by recent flooding. This, although unintended, allows for more close comparison of some of the cultural comparison themes as the hazard experience is less of a contrast that in would have otherwise been, even more so because neither location (UK or Belize) had experienced serious flooding in recent years and neither, despite some degree of warning, had expected the degree of flooding that occurred.

Differences in type of prior experience may in part be due to the fact that in Belize more people live and work in the same place and samples were selected in both countries by residential areas affected by flooding (UK) and hurricanes (Belize). Therefore in the UK, where more people tend to travel to work, the workplace may not have so often been affected as well as the home. The loss of services cannot, however, be so easily explained this way and is most likely due to an already much poorer infrastructure for electricity and water

supply than in the UK. The difference in reported feelings of personal danger is interesting. As discussed in the UK chapter, this measure relies more heavily on perception than do the other prior experience measures and could therefore indicate only a difference in the way that events are perceived. Or, as is more likely the case here given the information gathered during time in Belize, this difference is a reflection of the shock felt by the experience of waking in the night to find themselves literally floating already due to the speed of water level rise. This and the fact that people reported feeling more in danger due to the novel nature of the event and the fact that it was not accurately predicted compared to the normal hurricane risk which they feel that they know how to deal with and are at least more familiar with.

For all of the main sections of the survey, there were far more differences by country than there were similarities and this finding is in itself worthy of some discussion before looking at the detail. It was found that in general, the Belizeans give more positive scores for most items, indicating a possibly more optimistic outlook towards EWEs and their management, despite their personal experiences. This is particularly interesting when looking at certain findings like the one discussed above that showed that there was a higher number of Belizeans reporting feeling in personal danger from EWEs. It is possible that there is a cultural difference in the way that questionnaires are completed and that this has led to these almost universal country differences. There are, however, a number of items that do not show significant differences by country and these are worthy of note and discussion whilst acknowledging the possibility that the above may also be true.

For example, the Belizeans generally gave higher scores on all items in section one, relating to the incidence of EWEs in the past and into the future, and also to their potential management. They did not, however, give significantly higher scores on a small number of particular items; the ease of predicting EWEs, the opinion that there is plenty that can be done to prevent the worst effects of EWEs on people and the preference not to think about EWEs. It is possible that in Belize, whilst the people have observed a general trend towards worsening weather conditions as reported in the UK also, they do not see the events as any more difficult to predict due to the higher levels of trust they display in those who predict them, namely the scientists, media and

government. In other words the difference in the statement about EWEs becoming more difficult to predict may have been interpreted as referring not so much to the nature of the events themselves, as is the case when asking about severity and frequency, but as a measure of the faith they have in those who predict them. For the other items in this section it is difficult to speculate as to why there are no significant differences between the two countries and further research would be needed to confirm that these findings reveal anything that could be of value in the management of EWEs.

The Belizeans reported feeling both more responsible and more able to protect themselves, their properties, their neighbours and their neighbours' properties than did the UK participants. This may reflect the above mentioned difference in how questionnaires are completed, or may be an indication that in Belize there is a more positive attitude towards dealing with EWEs. This was certainly the feeling from time spent with communities there, not only about EWEs, but about life in general. There was a strong observed tendency towards optimism and the feeling that with a little help from the right places, whether that would be the authorities or each other, all will be well in the end. This was often accompanied by a faith in their religious beliefs too. In the UK, there was instead a stronger impression of suspicion as to the motives of the authorities and this will be discussed further in exploring the findings from the trust section. There was also a greater tendency in the UK for people to express a sense of entitlement that someone somewhere ought to be keeping them safe. This is borne out by the difference in the statement that 'the best way we can help ourselves is by helping each other', with which the Belizeans showed significantly stronger agreement. This was also the case for the feeling that one should not have to take action unless others are seen to be doing the same, in that the Belize sample disagreed with this more strongly. This again reinforces a greater tendency towards co-operation and collaboration in Belize than in the UK and this supports the findings of the field work and also the general impressions gathered during data collection in the two locations.

The relative risk items showed difference only in the risk perceived to their country versus other countries and not on items comparing their region with other regions in the country and their house compared to other houses in the neighbourhood. This reflects the reality of the situation in that Belize is more

at risk than many other countries around the world due to its location in an area regularly impacted upon by hurricanes and tropical storms, whilst in general the UK has not tended to be at high risk of natural disasters due to its climate and location away from areas of high geophysical risk.

As mentioned earlier, the Belizeans tended to give higher scores across the sections and this was certainly the case in the trust section. They gave higher average trust scores across all agents on all items than did the UK participants and this could be due to the overall difference in the way that they complete questionnaire surveys, or to a general cultural tendency towards greater optimism. The more specific findings in the country and agent interactions give more information, however, and allow for some further discussion. For example, Belizeans give higher scores to the media both for giving accurate information and for knowledge about the risks of EWEs than do UK participants. This is also a finding that reinforces observations made during field work in Belize and discussed in the Belize chapter, in that communities there said that they tend to rely heavily on information from the TV and internet due to the fact that they are in remote locations and do not feel that they receive warnings from elsewhere as quickly and effectively. The older generation expressed disappointment that media sources were now being relied upon at the expense of traditional knowledge but did also acknowledge the value of the information available via modern technology in terms of speed of dissemination and volume of information when used together with more traditional methods.

The Belize scores showed a greater belief that the national government, as well as the media, have the people's interests at heart than in the UK and this was also the feeling during data collection. Conversations with people in flood affected areas in England revealed a tendency to feel let down by the authorities but it was difficult to discern how much this was down to actual failures to provide basic services and information and how much of it was more about high levels of expectation in the culture. The latter has been observed to a degree in both the UK and USA compared with less wealthy countries with more collective cultural practices and is borne out by the findings here. This is especially the case in that there was no evidence that the government in Belize had done any more to help than in the UK and in fact if anything, due to lack of resources and the fact that the most recent event had taken everyone by

surprise, the Belize government had not been able to offer as much help to the communities as had the UK government. This observation is of course based only on speculation and a general impression gained during data collection, so a study including measurements of actual government interventions alongside community opinions would be useful in exploring this apparent cultural difference and its possible causes in more depth.

One final difference in relation to country differences that is worthy of note in the trust section is that of scores given to friends and family. The Belizeans gave a significantly higher score to friends and family for their capacity to manage EWEs and this could be interpreted as further evidence of a greater trust in and reliance on community members rather than authorities when it comes to the risks associated with the weather. This was certainly a hypothesis formed from earlier time spent in developing countries with seemingly more community oriented cultures and this finding offers reinforcement to the view that there is more of a tendency to rely on each other than on outside entities in such cultures. This theme is further evidenced by findings in the community and place attachment section.

On measures of perceived level of attachment to and identification with their community, the Belizeans gave higher scores as predicted from general observations in other developing countries. During visits to other small communities, such as those in Thailand mentioned in the introduction, there appeared to be a greater sense of cohesion and community in day to day life rather than only in reaction to an event and this in turn seemed to make the communities feel more resilient to threats from outside of the community. In the UK, it seemed more the case that neighbours felt a new closeness as a result of the flooding, but found that they were not able to maintain this after the initial aftermath had passed and life had been restored to relative normality. This was reported to be the case in the Gulf Coast of Texas after Hurricane Ike also. It was therefore predicted that in Belize, the participants would report a greater attachment to their community and that this should sit alongside a lesser reliance on outside assistance and a greater feeling of resilience. These predictions are supported by the current data.

Belizeans also show greater agreement that EWEs are just something to be put up with in order to live where they live, show less distress at losing material possessions and show a greater preference to continue to live in their current communities even if the risk were to become greater. This offers further evidence of the suggested role of community cohesion and attachment in attitudes towards the risk of EWEs in that there is a greater willingness to put up with the risks rather than move away and this is in contrast to the frequent assumption that people do not move to safer areas simply because they do not understand the risk. These findings suggest that risks are calculated in relative terms alongside other priorities and that these factors may often end up being given priority over straightforward safety. Certainly, this has been observed in various locations around the world including the UK, USA, Thailand, Colombia and Belize. The priorities that compete with safety appear to differ depending on the cultural context, with place and community attachment tending to feature more highly in developing countries, but further research is needed on this theme. For example, in rural parts of the USA a more similar set of attitudes was found to those in Belize, than in the nearby urban areas in the USA. No actual data were collected on this, but the possibility that cultural differences may be about more than national identity would be a very worthwhile area for further research.

As for items on attitudes and beliefs, there were significant differences by country in engagement in preparedness behaviours. The particularly large difference between the numbers who say that they organise community meetings could be seen as further evidence of the cultural difference in community cohesion. There is, however, a need to exercise some caution in interpreting these behavioural data as they are based only on subjective reporting rather than actual observed or otherwise recorded behavioural engagement. As an illustration of the potential for these figures to be misleading, over one quarter of the Belizean sample report that they organise community meetings and yet during the time spent there on field work no evidence of such meetings being either carried out or organised was seen. This is not to say that they are not happening, only that the percentage of those who report this behaviour is rather high considering the relative number of people needed to organise a meeting compared to attend. This is especially interesting

given that compared to over one quarter who claim to organise meetings in Belize, less than half say that they attend and this seems a rather unlikely refection of reality. Further research including more accurate measures of behavioural engagement would be very useful.

Two thirds of the Belizean sample claim to construct defences in their home compared to only around one third of the UK participants and this is a more logical difference given that Belize has an annual hurricane season and the communities are accustomed to preparing themselves accordingly. It is possible that this also accounts for the large number who report that they organise community meetings, but the observed reality nevertheless suggests otherwise.

The importance of the behaviours are also reported as higher by the Belizeans and this could be either due to the general tendency to score more highly on most items, or it could be a reflection of the fact that they have in general more experience of living with the potential impact of extreme weather events and whether they have themselves been directly affected, in a country as small as Belize that has been hit by several hurricanes in recent years, they will be well aware of the potential consequences. As observed through the individual data sets, there is however still a tendency for there to be a mismatch between importance ratings and reported behavioural engagement across both countries so again further more targeted research would help to answer some of the questions raised by the current data sets.

In relation to climate change beliefs, cultural differences were found in the same direction again. More Belizeans agree that the climate is changing as a result of human activity and this reinforces the opinions given during time in the field. There was an observed tendency to be less defensive about climate change and it is possible that this is for two main reasons. Firstly, maybe they do not feel so responsible and therefore are not having to deal with feelings of guilt because their resource use is so low compared to industrialised countries and secondly, they do not have much that they would have to change to mitigate the effects of climate change for the same reasons. These speculations are based on the assertion that much of the disagreement with climate change is based on a mixture of guilt about possible responsibility for it and a resistance

to making changes to current lifestyles. Again, time spent in other locations added weight to this idea in that those in the USA appeared to display the highest levels both of disagreement with the existence of climate change and resistance to lifestyle change. This is another very valuable question to emerge from the data in terms of informing the design of a future and more specifically targeted study.

On items relating to the management of climate change the Belizeans appear again to have a more positive outlook than their UK counterparts in that they report a greater willingness to act in the face of uncertainty, a stronger belief that plenty can be done to prevent the worst effects of climate change on other species. It is interesting that they also show a stronger belief that there is nothing anyone can do to stop climate change happening and that scientists believe that it is really happening. So, whilst they show a stronger belief that climate change is a real threat, at the same they display more positive attitudes towards how it can and should be managed. Further information is provided by country differences in who is believed to be responsible for dealing with the effects of climate change, with higher scores given by Belizeans to both scientists and religious/spiritual leaders. This reinforces, again, observations made in the field as to the importance of religion in the attitudes and beliefs of the Belizean participants and also reflects that the role given to scientists in managing EWEs extends into the management of climate change too.

As a further extension from specific weather events to climate change, participants also gave information as their attitudes towards the natural environment as a whole. Belizeans showed a tendency to rate humans as less powerful than the natural world, but interesting at the same time showed stronger agreement than the UK sample that human beings should be able to control the natural world. This could again be a result of the tendency for Belizeans to give stronger responses to most items and in one sense appears contradictory, or could indicate alongside an acknowledgement that the natural world is more powerful than humans a desire for this to be different. In other words, one set of statements is about how things are and the other is about how participants would like things to be. These statements about general ecological beliefs are not central to the themes of this study but do provide interesting

additional information as to differences in attitudes and beliefs across contrasting cultures.

Finally, the decision making scales showed some differences in style by country but given the lack of relationships of these styles with other questionnaire themes and items, these findings are not deemed worthy of further discussion.

As discussed at the start of this section, differences between the two data sets are so widespread throughout the questionnaire that it is possible that these differences may be no more than an indication of a more general difference in the way in which the two cultures complete this type of survey. Having acknowledged this possibility, however, there was nevertheless a rich set of findings that could just as easily be attributed to differences in the way that people in the two different countries view and respond the risks of EWEs and climate change. As reinforcement of this as a more likely explanation for the differences than the way in which the survey was completed, many of the findings reflected observations made during field work in Belize, data collection in the UK and other visits to areas at risk from EWEs around the world. As a result, some of the findings provide direct support for previously stated hypotheses, like the belief that reported levels of community attachment would be higher in Belize and that this would sit alongside more positive and proactive attitudes towards the management of risk. Also shown in this study was a greater wish to remain in those communities even when faced with increased risk, which is extremely important in contributing to a better understanding of why so often people choose to stay at home and put themselves and their families at potentially greater risk.

The findings in this chapter also provide information that aids future study design by ruling out the role of some factors and drawing attention to other relationships and differences that may not otherwise have been identified. Here, community and place attachment is again a good example. It was believed that this theme would be of value in relation to the management of EWEs, in particular across different cultural settings, but an initial exploration was necessary first in order to narrow down the most useful factors for further investigation. This study has provided information about cultural differences in

community attachment and possible ways in which it may impact on attitudes, beliefs and preparedness behaviours which can now be used as a foundation for a more in depth follow on study.

As stated in the thesis introduction, one of the main initial intentions of the whole project was to introduce a cross hazard and cross cultural element to the design due to the fact that this has been missing in the majority of studies relating to people and EWEs. Due to the broad scope of the questionnaire this section, as is the case for the country specific chapters, has been necessarily brief in its coverage of the themes but is nevertheless believed to have provided some really useful findings for further research and for direct application in the field of disaster risk reduction.

Chapter Eight

General Discussion

The studies presented here were designed to be predominantly exploratory, with the hope that the data collected would help to narrow down and focus in on the vast number of potential factors at play in such a complex environment. This has indeed been the outcome and the next step must then be to identify more specific questions that may be answered using the theory and methods available. In taking a fresh look at the role of psychological research in DRR by conducting an exploratory study that is so broad in reach, whilst keeping in mind the potentially valuable theories and previous research findings, it has been possible to gather large amounts of descriptive information across a range of themes. These data are immediately applicable to policy considerations and therefore useful to decision makers at all levels. The study also provides data on relationships between variables and themes not studied together so far and this both confirms observations made in the initial information gathering phase and allows future studies to be developed with a clearer focus. A summary and discussion of the main findings and next steps will be presented first, followed by a general critical evaluation of the study design.

The study set out to explore a number of themes across different hazards and in contrasting cultural contexts in order a) to identify which of these themes emerge the most strongly, b) to provide provisional information as to how they interact and c) to create the foundation for identifying the most useful direction for more targeted application of psychological theory into the context of DRR. A large number of topics were identified as important for investigation in the information gathering stage and it was decided to cover as many as possible at the expense of some of the detail at this stage, which can be seen at least in part as an extension of the information gathering phase deemed necessary to incorporate psychology more fully and more usefully into DRR. Of all the themes, some emerged more strongly than others. For example place

attachment and trust and the interaction of prior experience with other variables such as gender and these will be summarised and discussed in a moment.

Some new themes were also revealed by the data and by the time spent in communities living at risk from EWEs, such as the role of event familiarity and threat habituation. Others contradicted existing theoretical concepts, such as that of 'Belief in a just world' (Lerner, 1980) and may benefit from being revisited in direct comparison with other studies of this theory when applied in other comparable contexts.

Another possible factor brought out through spending time with people living in at-risk areas but not directly covered in the current study is the role of evolutionary 'hard-wiring' to deal with and prioritise threats. This is a theme covered in an indirect way by evidence found here of the attention given to other perhaps lesser but more immediate concerns like earning money that day or remaining in a comfortable and familiar environment rather than moving to a safer but unknown location. Or, the instinct to deal with a threat when it can be directly seen or heard rather than via a third party, like people going outside to see a tornado before taking shelter even though the warnings were sounded. All of these themes having been identified more clearly here, could now provide separate and more specifically tailored individual studies, drawing on their own distinct body of literature and finally being brought back together to paint a more complete and coherent picture.

Also identified out of experiences with communities rather than the data was a question as to the type of information that people felt that they want to be given. Some said that they would rather not be overloaded with facts and instead simply be told what to do, whilst others said the opposite in that they would prefer to be given full information so that they could arrive at their own conclusions and actions. This was not foreseen at the time of study design, but the literature on the theory of 'need for cognition', which has been applied in the field of advertising, would be useful in shaping a study on this theme (Zhang & Buda, 1999).

The Belize qualitative section is particularly illustrative of the value of gathering information directly from the communities and from observing them in all of the complexities of the context in which the hazard presents itself and this

chapter is therefore very complementary to the quantitative data. Observations such as these cannot be made in laboratory experiments or even really by quantitative survey data so for the subject matter being researched here it is really important to employ a mixed methods approach. This is an important consideration in relation to the issues discussed around cross-cultural research and confirmed that methods designed in a Western context may not be appropriate in a different cultural context (Marshall & Batten, 2003). This was especially apparent in the low number of questionnaires completed compared to the vast amount of data collected by a more participatory, ethnographic approach on the second phase of the field work. It has proved particularly valuable to have designed survey themes predominantly around observed phenomena rather than out of theories developed in other contexts. Literature from the other social sciences could have been explored in more depth but this will be easier now that certain themes have been established as especially important. As stated in the introduction, the body of literature was too large at the outset for the number of themes tackled here but it will now be possible to narrow this down in order to conduct distinct studies to cover each of the themes and combinations of themes identified from the current results. For example, place attachment and trust have both emerged as extremely important in how people respond to the risk of EWEs and with this in mind a thorough review of these two bodies of literature can examine how the relevant theories may be interwoven in new study to examine how these two specific factors may interact to influence response.

Many of the results presented in the preceding chapters have also been shown to hold great value in their own right and may already be used to help policy makers and authorities learn more about the people they are seeking to help and these has been highlighted in the individual chapter discussions. Other results reveal new questions as to how certain factors may contribute to and interact with others in order to produce some of the choices people make that may at first glance appear at best slightly irrational and at worst, downright foolish! For example, the general perception that EWEs are getting worse illustrates that it may not be necessary to place so much emphasis on persuading people that they are at risk and instead spend more time understanding what else is getting in the way of taking preparedness actions.

Also, trust has emerged as a key theme throughout the studies. Faith in scientists was found to be strong across the locations and this is important in considering sources of risk information and how this information is delivered. The individual indicators of trust, such as knowledge, having interests at heart etc. also provide a useful insight into the makeup of what can otherwise become a rather ambiguous concept. By understanding who is trusted the most in each of these elements and in turn which elements are the most important in predicting behavioural outcomes, the complexity of the role of trust can be methodically unpicked.

This leads onto the theme of behavioural engagement. Overall, one of the main aims of conducting social science research in this context is to understand better what causes people to engage in preparedness behaviours or to fail to do so. This was certainly a strong focus in the design of the study and the hope was that behavioural measures may be used as a dependent variable with the various other themes as predictors. However, in this study the results showed that emphasis on behavioural measures was low. This was because in reality the measures were of reported behavioural engagement rather than actual observed or otherwise recorded actions. As a result they are a subjective measure and could not ultimately be relied on to provide the information that was hoped for. It would be useful to gather data based on either observed reports of engagement in behaviour or other more concrete measures, for example attendance registers at planning meetings or physical presence of home defences (shutters for hurricane risk for example) or preparedness kits.

Another theme that has been shown to be important in this study is that of traditional knowledge, although in this case it has not been measured qualitatively. In order to incorporate useful measures of this type of knowledge for integration into future studies and comparison with other variables, observations provided here could be categorised. For example, as well as considering when it is used, some traditional knowledge appears to be helpful in encouraging preparedness behaviours and some not. For example, the land crab behaviour in Belize that was ignored to the detriment of the community at Gales Point because they chose to trust the Weather Channel and NEMO who did not realise that TS Arthur was going to be so extreme and destructive. In

contrast many people in Norman, Oklahoma expressed a belief that tornadoes will not cross certain land features such as the river, which they believed was keeping them safe. A tornado outbreak on May 10th 2010 changed all this when more than thirty tornadoes hit the town and surrounding areas leaving five dead and dozens injured. Clearly, these beliefs play a role in the choices people make but how can they be incorporated into hazard planning earlier so that they are not only called into question when the damage has already been done?

Gender differences were examined as an underpinning theme throughout the studies and yielded some very useful results. It was confirmed that women tend to perceive higher levels of risk in general and this reinforces findings from other risk perception studies such as Pidgeon et al. (2003). In addition to this there were some more surprising findings in relation to reported behavioural engagement in that it was women who appear to initiate both community level preparedness activities, such as organising community meetings, and household level protective measures such as building defences. It has traditionally, in the UK at least, been assumed that men will take the roles both of community leaders and will also be more likely to build physical defences in the home and in this study this is not the case. It would be useful to conduct a study focusing specifically on gender roles in preparedness actions in order to investigate this finding further. It is also valuable information in its current form in that policy makers armed with this knowledge can then use communication strategies known to be more effective with women in other contexts in order to encourage community and household level preparedness.

The section on climate change and beliefs about the wider natural environment was added due to the obvious potential for overlap with factors relating to EWEs and this theme has already been provisionally explored by others (e.g., Tompkins & Hurlston, 2005). This was an ambitious inclusion given the breadth of themes already included in relation to EWEs, but did add some interesting descriptive information and indicated some relationships worthy of further exploration as described in the chapter discussion. Also, the body of literature for climate change is vast and growing rapidly, so would have required an extensive literature review in order to do full justice to the topic. A recommendation for a future publication would be to revisit the data already collected on this theme, as there is a great deal of useful information, and

analyse it in more depth in relation to specific questions raised through a more thorough literature review.

Also in this section were items relating to attitudes and beliefs about the wider natural environment and these were included as a kind of continuum from specific EWEs, to more general effects of climate change to the whole natural environment and the way in which humans relate. These items were written by the author but it was discovered after data collection that there was a scale already in existence covering almost identical material. The New Ecological Paradigm (NEP) Scale (Dunlap et al., 2000) seeks to explore the existence of an 'ecological world view' and as such would be a useful tool in order to measure the validity of the newly created scale in another separate study.

A limitation of the methodology chosen is that the number of different themes and items make analysis of every relationship between these themes and variables impossible. This was the reason for choosing two underpinning themes, gender and prior experience, to analyse in relation to all other themes, but meant that many other themes were unable to be analysed in relation to each other. This does, however mean that the data sets could be revisited in a number of new ways in order to tease out more specific relationships between variables. Some examples of relationships that would benefit from further examination are feelings of responsibility with community and place attachment in order to better understand the dynamics of the perceived roles of self and others, self-efficacy with trust in order to look for relationships between perceived abilities of self in relation to other and type of prior experience with beliefs about future risk. It would also be useful in future studies to include measures of reported emotional reactions of individuals to the experiences they had. This would help to give more depth to the understanding of the nature of prior experience from the perspective of affect as well as effect.

Perceived levels of responsibility were found to correlate with perceived levels of self-efficacy, but in this study there were very few relationships between these variable and other themes and this is in contrast to other studies (e.g. Mulilis & Duval, 1997). This may be due to the study design and the fact that these factors were measured in amongst such a large number of other variables, or in the way that the items were worded. If this theme was to be

studied in isolation from other themes it would be useful to use the previous studies as a backdrop.

In the introduction it was pointed out that often lack of preparedness or other maladaptive strategies employed in the face of risk seem irrational and/or stupid and are often attributed to a lack of understanding of the risk. When the factors identified here are taken into account, these choices are much more understandable and could therefore be better predicted and alternatives provided and encouraged. For example, community attachment considerations could lead to better co-ordinated evacuation plans or more emphasis on community based solutions such as better shelters. This helps towards place attachment issues too. Also, more community involvement in hazard planning helps to address all of these issues, plus trust, as has been shown in Colombia last year.

The gap between attitudes/beliefs and behaviours is at the heart of much of the confusion as to why people make the choices that they do. This study confirms that there is indeed a large disparity between an understanding of the importance of preparedness behaviours and actual reported engagement in these behaviours. If people understand the level of risk and also know the importance of engaging in certain behaviours, then why do they not do so? A return to the large body of available literature on attitudes would be helpful in designing a further study to seek an explanation for this gap in the context of hazard preparedness.

The cultural comparisons found in this study have been discussed in depth in the relevant chapter discussion, but a point worth emphasising is the finding that there was a general tendency for the Belizean sample to answer the entire questionnaire quite differently than the UK one and this limits the value of the findings somewhat. The qualitative section does not offer direct comparisons with the UK data set, but gives compensatory information in that it helps to draw a much more elaborate picture of the context in which the Belizean people are forming their beliefs and making their choices. This section offers much in the way of pointers to further research in that particular location, such as the measurement of factors leading to evacuation based on specific hypotheses that could be formed from the descriptive information. For example,

some said that their religious beliefs led them to stay at home and have faith that they would be protected, others feared that their homes would be looted and some said that they preferred to be in familiar surroundings than to be safe. All of these factors could be incorporated into a quantitative research design to examine the relationships more closely.

In the light of the findings summarised above, there are also a number of recommendations for further studies on particular themes. There were many useful findings about trust in the six agents and how the categories of trust relate to each other, but it would be useful to take this a step further and investigate more closely the relationships between prior experience of these agents in dealing with risk, current trust levels at the time of a study and future behavioural intentions. This would help to build a clearer picture of the role of trust over time in a similar way to that of prior experience.

Equally, the nature and relationship of place and community attachment would be an extremely interesting and valuable area for further investigation. In this study various relationships were found between community attachment and other variables but the value was diluted by the vagueness of the items of measurement. As discussed in the introduction it is not clear, for example, to what degree community attachment refers to people or place and therefore to what degree it overlaps with place attachment. Similarly, place attachment may refer to the house in which an individual lives, the wider surroundings of the neighbourhood or village or town, or the land on which they work. Indeed these distinctions appeared in conversations with people in different locations around the world but were not included in the quantitative analyses. Many of those in developing countries display a strong attachment to the land and general area more that the house in which they live, whilst in the UK the tendency was to favour the home. A future study would involve an in depth exploration of the literature on community and place attachment and the inclusion of measures that allow for the cultural differences observed during this piece of research.

Having drawn together and discussed the main findings and offered recommendations for further and more targeted studies as a next step, a final necessary step is to offer a critical evaluation of this project.

Throughout the chapter discussions, observations of individual issues that arose around specific elements of the study in relation to location and theme have been presented. For example, the issues of small sample size in Belize and the decision not to transcribe interviews carried out in the villages due to background noise and language issues.

In addition to these lessons learned as the study progressed, there are a number of issues that have emerged on reflection at the end of the project as a whole. During the information gathering phase it became clear that this field of research is new and full of exciting challenges. The number of research questions that psychology is ideally equipped to explore is enormous, as are the bodies of literature that accompany the relevant theoretical and conceptual fields. During the literature review it was acknowledged on more than one occasion that to review each relevant body of literature would simply not be possible. On reflection, this was perhaps an indication that the number of thematic areas was too ambitious for the scope of the study. It is certainly the case that all of the areas included in the survey are important areas for new research, but to cover all of them in one study led to the exclusion of a large amount of data at the analysis stage. That said, all of the data were presented descriptively and are therefore of use, as described in the chapter discussion, even without examination of every relationship between every variable and theme. In addition to this, the data sets are now available to further analysis on particular themes. On balance, however, it is acknowledged that had more time been available, the questionnaire would have benefited from significant editing in order not to compromise depth for breadth, as has undoubtedly been the case here.

It was also apparent at the design stage that there was a strong need for research that included cross-hazard and cross-cultural elements, as well as a longitudinal element. The latter was not possible in the timescales available but the first two were rather ambitiously both incorporated in the design. In reality, due to the intervention of Mother Nature, both locations at the time of data collection were in the aftermath of a severe flooding event. So, despite

differences in prior experience, in that most of the Belizean sample had previous hurricane experience whilst the UK sample did not, the cross-hazard element was lost in this case. The cross-cultural element yielded some interesting results, but the data also uncovered a general difference across items that may in fact be due to cultural differences in the way in which responses are given in survey questionnaires. A more careful consideration of general differences between Belizean and British culture may have led to a clearer understanding of these issues at the design phase. The intention was more to identify similarities across cultures in order to draw conclusions about the relationship between humans and the natural environment over and above the effects of culture, but in reality little information was found to support this goal. Future studies with a cross-cultural element would benefit from being clearer about the expected similarities and differences between the chosen cultural locations.

It is clear now at the end of the project that the information gathering and analysis of the role of psychology in DRR could comfortably have taken up a whole PhD project. Had this phase already been completed by others before, then the choice of research questions and themes could perhaps have been more selective and the literature less compromised. It was, however, designed at the outset to be an exploratory study and this could arguably be said as much about the design as about the content. In future, the author would certainly not chose to cover such a wide range of themes across different hazard types and cultures within the time scale available here.

Alongside the design issues recognised throughout the design and execution of the project, some more theoretical questions were raised and are worthy of comment.

Further to the application of the findings and their contribution to future studies, another very important question emerged strongly in general conversations and observations and yet appears very rarely to be asked in formal research. The question regards the exact nature of the end goal of a risk communication and this is not necessarily as simple as an expressed desire to 'keep people safe'. This is a very political question in many ways and will depend both on national government policy and the goals of individual decision

makers, but it is nevertheless an important consideration in deciding what research questions to ask. If the desired outcome is to manipulate behaviour so that warnings are heeded and death statistics are reduced then this will require a very different strategy than if the goal is to provide full information and resources in order to allow empowered individual decision making regardless of the behavioural outcome. This is an essential distinction in shaping future research if it is to be of value to real world application as the theories employed and studies carried out could be very different depending on which is chosen as a priority. For example, the first would be more likely to suggest marketing as a transferable theme and body of research to draw from as it seeks to change behaviours without necessarily requiring conscious and deliberate choice making. The second would be far more participative but ultimately respect each individual's choice to be safe or to put themselves in danger in favour of other priorities.

From a research perspective this is also an important consideration when entering into international collaboration as desired outcomes may vary depending on the intended location and nature of application of the results. All of those embarking on a collective project would need either to have the same goals or to be clear where and what the differences are and these would need to be discussed fully before research projects are designed. Otherwise, the value of the results could be compromised later and the application rendered ineffective.

A wider sampling consideration emerged as a result of circumstances immediately before data collection in both UK and Belize and would be important to include in future research plans. The questionnaire was designed to be carried out in areas where the risk of extreme events was present but where the residents may or may not have recent experience of one themselves, either due to the time since the last event occurred (in the case of Belize) or because the risk had not yet turned into a reality (as for the UK). It has already been pointed out that it may have been useful to include in the design a sample that do not live in risk areas for comparison, but in addition to this the samples chosen for the study changed in nature during the data collection phase due to circumstances. The devastating floods of 2007 occurred only a couple of weeks before data collection was conducted in the UK, which meant that many

affected residents had not yet returned to their homes and most of the sample had at the very least witnessed the aftermath. In Belize, TS Arthur hit only a few days before data collection so that much of the sample were also in the immediate aftermath of an EWE. It would be useful to conduct future studies in populations that do not have such recent experience of a major event in order to investigate more clearly the views held by those who live with a risk that has not recently materialised.

Finally, one last question has emerged from the overall experience of compiling ideas, designing and conducting this piece of research that seems a central theme in choosing how to proceed. In the views expressed by the majority of scientists and decision makers consulted in this piece of the work, the desired outcome of this research was ultimately to help communities to better understand the nature and severity of the risks in order that they may keep themselves safe. In the views expressed by the majority of community members, the desired outcome would be to help decision makers to better understand them, their beliefs and their priorities in order that they could help them to make the best decisions in order to manage the many risks and situations that they find themselves juggling with on a day to day basis. This simple and yet fundamental difference in world view beautifully illustrates the need to keep searching for a deeper and fuller understanding of people in their diverse and complex contexts.

This was an ambitious and study and extremely broad in its reach. With this came a great deal of useful learning as well as much opportunity to learn from mistakes. All in all, it did address a number of gaps in the existing literature and has provided a solid foundation for future psychological research in the pursuit of more effective DRR. Its contribution is original in including cross-hazard and cross-cultural elements, in applying a social psychology model of decision-making to the context of EWEs. Whilst some work has examined the overlap between EWEs and climate change, no other was found that has taken the extra step to examine wider attitudes to the natural environment. Despite limitations caused by an overstretch in scope for the size of the project, this piece of research has provided, alongside the data presented and discussed, a

previously unavailable and broad examination of the potential application of social psychological theory to the context of DRR. It can now be a platform from which new research can be designed based on clear themes and questions as opposed to a general gamble as to which questions and theoretical areas might provide the most complete answers in a virtually unexplored but fascinating territory.

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Appendix I: Pilot Questionnaire

Region:

The University Of Sheffield.

Extreme Weather Events and Natural Disasters:

Tell Us What You Think

Please read the following notes before beginning the questionnaire

This survey is part of an international study of people's attitudes to extreme weather events (e.g. hurricanes, floods, cyclones) in different parts of the world. We are interested in finding out your thoughts about how best to prepare for such events, and how you feel about the uncertainty and risk associated with when and how they may occur. Please answer all the questions, even if you're sometimes unsure. There are no right or wrong answers. It's your own personal experience and opinions we're interested in.

Firstly, we're interested in how any of these kinds of extreme weather events may have affected you, other members of your family, friends or neighbors.

Have you personally been affected by *(tick any that apply)*:

- ☐ **Flooding?**
- ☐ **Hurricanes/wind storms?**
- ☐ **Other (please specify)?**

When was this?

How were you affected? ***(tick any that apply)***

Personal injury
Personal danger
Damage to property (e.g. home, car, garden, pets, livestock, crops)
Damage to workplace
Disruption to work, business, education.
Disruption to transport, travel
Loss of services (electricity, water)
Other (please describe briefly):

Were any other members of your family affected?

Yes [ ] **No [ ]**

If so, how? ***(tick any that apply)***

Personal injury
Personal danger
Damage to property (e.g. home, car, garden, pets, livestock, crops)
Damage to workplace
Disruption to work, business, education.
Disruption to transport, travel
Loss of services (electricity, water)
Other (please describe briefly):

Please tell us more about any of your answers above, if you wish.

1. Tell Us What You Think About the Risks of Extreme Weather Events

1.1 Please indicate to what extent you agree with each of the following statements:

1.1.1 I think that extreme weather events are becoming more severe.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

1.1.2 I think that extreme weather events have become more frequent over the last 10 years.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

1.1.3 I think that extreme weather events will become more frequent over the next 10 years.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

1.1.4 I think that extreme weather events are becoming more difficult to predict.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

1.1.5 There's nothing anyone can do to stop extreme weather events happening.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

1.1.6 There's plenty that can be done to prevent the worst effects of extreme weather events on people.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

1.1.7 When natural disasters happen, the people who suffer most are usually the poor and vulnerable.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

1.1.8 When natural disasters happen, the people who suffer most are usually those who've done least to protect themselves.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

1.1.9 I feel at personal risk from extreme weather events.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

1.1.10 I feel frightened at the thought of extreme weather events.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

1.1.11 I prefer not to think about extreme weather events.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

1.1.12 I think that extreme weather events should as far as possible be prevented from happening in the first place.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

1.1.13 I think that as much as possible should be done to protect people from extreme weather events when they occur.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

1.1.14 I think that as much as possible should be done to minimise economic losses when extreme weather events occur.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

1.1.15 I think that as much as possible should be done to minimise social disruption (e.g. evacuation, relocation) when extreme weather events occur.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

1.2 Please indicate to what extent you agree with each if the following statements:

1.2.1 I *should* protect myself/my family from extreme weather events.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

1.2.2 I *can* protect myself/my family from extreme weather events.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

1.2.3 I *should* protect my property from extreme weather events.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

1.2.4 I *can* protect my property from extreme weather events.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

1.2.5 I *should* help my neighbors to protect themselves from extreme weather events.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

1.2.6 I *can* help my neighbors to protect themselves from extreme weather events.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

1.2.7 I *should* help my neighbors to protect their property from extreme weather events.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

1.2.8 I *can* help my neighbors to protect their property from extreme weather events.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

1.3 Please indicate to what extent you agree with each of the following statements:

1.3.1 There is little point in me doing things to protect my local environment from extreme weather events if my neighbors aren't doing the same.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

1.3.2 I shouldn't have to take action against extreme weather events if others aren't doing the same.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

1.3.3 I do more than others in my neighborhood to protect my local environment from extreme weather events.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

1.3.4 The best way that we can help ourselves is by helping each other.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

1.4 Compared to other parts of the world, do you feel that this country is more or less at risk from extreme weather events?

Much more	A little more	About the same	A little less	A lot less
☐	☐	☐	☐	☐

1.5 Compared to other parts of this country, do you feel that this part is more or less at risk from extreme weather events?

Much more	A little more	About the same	A little less	A lot less
☐	☐	☐	☐	☐

1.6 Compared to other homes in your neighborhood, do you feel that your home is more or less at risk from extreme weather events?

Much more	A little more	About the same	A little less	A lot less
☐	☐	☐	☐	☐

1.7 How much do you *trust* each of the following to give you accurate information about risks of extreme weather events?

	Not at all	A little	Somewhat	Very much
The federal government	☐	☐	☐	☐
The state/local government	☐	☐	☐	☐
Scientists	☐	☐	☐	☐
Local community figures	☐	☐	☐	☐
The media	☐	☐	☐	☐
Friends and family	☐	☐	☐	☐

1.8 How much do the following *know* about risks of extreme weather events?

	Not at all	A little	Somewhat	Very much
The federal government	☐	☐	☐	☐
The state/local government	☐	☐	☐	☐
Scientists	☐	☐	☐	☐
Local community figures	☐	☐	☐	☐
The media	☐	☐	☐	☐
Friends and family	☐	☐	☐	☐

1.9 How much do the following *have your interests at heart* when it comes to risks of extreme weather events?

	Not at all	A little	Somewhat	Very much
The federal government	☐	☐	☐	☐
The state/local government	☐	☐	☐	☐
Scientists	☐	☐	☐	☐
Local community figures	☐	☐	☐	☐
The media	☐	☐	☐	☐
Friends and family	☐	☐	☐	☐

2. Tell Us About Your Community

2.1 How long have you lived here?

.....**years**

2.2 Do you live here all year round?

Yes ☐ **No** ☐

2.3 How attached do you feel to the community here?

Extremely Attached	Quite Attached	Somewhat Attached	Not Attached
☐	☐	☐	☐

2.4 How many members of the community do you regard as personal friends?

.....**members**

2.5 How much do you feel that you identify with this community?

Not at all	A little	Somewhat	Very much
☐	☐	☐	☐

3. Tell Us About Your Actions Regarding Extreme Weather Events

3.1 Below are some of the things that people do to guard against extreme weather events. Please indicate which of them you do yourself: ***(tick any that apply)***

Organize community meetings to exchange ideas and plan for extreme weather events	☐
Attend community meetings to exchange ideas and plan for extreme weather events	☐
Follow recommendations from the federal or state government	☐
Construct defences in your own home	☐
Campaign for action by the federal or state government	☐
None of the above	☐

3.2 How *important* do you think each of the above activities is?

3.2.1 Organize community meetings to exchange ideas and plan for extreme weather events.

Not at all important	A little	Somewhat	Extremely important
☐	☐	☐	☐

3.2.2 Attend community meetings to exchange ideas and plan for extreme weather events.

Not at all important	A little	Somewhat	Extremely important
☐	☐	☐	☐

3.2.3 Follow recommendations from the federal or state government.

Not at all important	A little	Somewhat	Extremely important
☐	☐	☐	☐

3.2.4 Construct defenses in your own home.

Not at all important	A little	Somewhat	Extremely important
☐	☐	☐	☐

3.2.5 Campaign for action by the federal or state government.

Not at all	A little	Somewhat	Extremely
☐	☐	☐	☐

Do you do anything else in preparation for extreme weather events that you would like to tell us about? If so, please tell us in the box provided below.

4. Tell Us What You Think About Climate Change

4.1 Do you personally feel that the world's climate is changing as a result of human activity or not?

Yes	[ ]
No	[ ]
Not sure	[ ]

4.2 To what extent do you believe that climate change contributed to each of the following events?

4.2.1 The Asian Tsunami in December 2004?

Not at all	A little	Somewhat	Extremely	Don't know
☐	☐	☐	☐	☐

4.2.2 Hurricane Katrina in August 2005?

Not at all	A little	Somewhat	Extremely	Don't know
☐	☐	☐	☐	☐

4.2.3 Floods in Central/Northern England in July/August 2007?

Not at all	A little	Somewhat	Extremely	Don't know
☐	☐	☐	☐	☐

4.2.4 Hurricane Dean in Jamaica in August 2007?

Not at all	A little	Somewhat	Extremely	Don't know
☐	☐	☐	☐	☐

4.2.5 Fires in California in October 2007?

Not at all	A little	Somewhat	Extremely	Don't know
☐	☐	☐	☐	☐

4.2.6 Floods in Mexico in October/November 2007?

Not at all	A little	Somewhat	Extremely	Don't know
☐	☐	☐	☐	☐

4.2.7 Cyclone in Bangladesh in November 2007?

Not at all	A little	Somewhat	Extremely	Don't know
☐	☐	☐	☐	☐

4.3 Please indicate to what extent you agree with each of the following statements:

4.3.1 I believe that the risks of climate change have been greatly exaggerated.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

4.3.2 Scientists now agree that climate change is really happening.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

4.3.3 There's nothing anyone can do to stop climate change happening.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

4.3.4 There's plenty that can be done to prevent the worst effects of climate change on people.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

4.3.5 There's plenty that can be done to prevent the worst effects of climate change on other species.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

4.3.6 There's plenty that can be done to prevent the worst effects of climate change on the natural environment.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

4.3.7 Climate change must be addressed through the development of new technology.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

4.3.8 Climate change must be addressed through every individual changing their lifestyle.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

4.3.9 I believe that it is the responsibility of governments to prevent further damage to the natural environment.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

4.3.10 I believe that it is every individual's responsibility to prevent further damage to the natural environment.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

4.3.11 I believe that human beings are entitled to use the natural world for our own benefit.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

4.3.12 I believe that the natural world is a resource for the use of human beings.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

4.3.13 I believe that human beings are at the mercy of the natural world.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

4.3.14 I believe that human beings and the natural world are dependent on each other.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

4.3.15 I believe that human beings need to be able to control the natural world.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

4.3.16 I believe that human beings are absolutely part of natural world.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

4.3.17 I believe that the natural world is more powerful than human beings.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

5. Tell Us About How You Make Decisions

5.1 People differ in how comfortable they feel about making decisions. Please indicate how you feel about making decisions by ticking the response which is most applicable to you.

		True for me	Sometimes true	Not true for me
(1)	**I feel confident about my ability to make decisions**	[ ]	[ ]	[ ]
(2)	**I feel inferior to most people in making decisions**	[ ]	[ ]	[ ]
(3)	**I think that I am a good decision maker**	[ ]	[ ]	[ ]
(4)	**I feel so discouraged that I give up trying to make decisions**	[ ]	[ ]	[ ]
(5)	**The decisions I make turn out well**	[ ]	[ ]	[ ]
(6)	**It is easy for other people to convince me that their decision rather than mine is the correct one**	[ ]	[ ]	[ ]

5.2 People differ in the way they go about making decisions. Please indicate how you make decisions by ticking for each question the response which best fits your usual style.

When making decisions -		True for me	Sometimes true	Not true for me
1.	**I feel as if I'm under tremendous time pressure when making decisions**	[ ]	[ ]	[ ]

2.	I like to consider all of the alternatives	[ ]	[ ]	[ ]
3.	I prefer to leave decisions to others	[ ]	[ ]	[ ]
4.	I try to find out the disadvantages of all alternatives	[ ]	[ ]	[ ]
5.	I waste a lot of time on trivial matters before getting to the final decision	[ ]	[ ]	[ ]
6.	I consider how best to carry out the decision	[ ]	[ ]	[ ]
7.	Even after I have made a decision I delay acting upon it	[ ]	[ ]	[ ]
8.	When making decisions I like to collect lots of information	[ ]	[ ]	[ ]
9.	I avoid making decisions	[ ]	[ ]	[ ]
10.	When I have to make a decision I wait a long time before starting to think about it	[ ]	[ ]	[ ]
11.	I do not like to take responsibility for making decisions	[ ]	[ ]	[ ]
12.	I try to be clear about my objectives before choosing	[ ]	[ ]	[ ]

13.	The possibility that small things might go wrong causes me to swing abruptly in my preferences	[ ]	[ ]	[ ]
14.	If a decision can be made by me or another person I let the other person make it	[ ]	[ ]	[ ]

When making decisions -		True for me	Sometimes true	Not true for me
15.	Whenever I face a difficult decision I feel pessimistic about finding a good solution	[ ]	[ ]	[ ]
16.	I take a lot of care before choosing	[ ]	[ ]	[ ]
17.	I do not make decisions unless I really have to	[ ]	[ ]	[ ]
18.	I delay making decisions until it is too late	[ ]	[ ]	[ ]
19.	I prefer that people who are better informed decide for me	[ ]	[ ]	[ ]
20.	After a decision is made I spend a lot of time convincing myself it was correct	[ ]	[ ]	[ ]
21.	I put off making decisions	[ ]	[ ]	[ ]
22.	I cannot think straight if I have to make decisions in a hurry	[ ]	[ ]	[ ]

Finally, please tell us something about yourself.

Are you Male [ ] Female [ ] ?

How old are you? ..... years.

Do you own your own home? Yes [ ] No [ ]

Is your home insured against floods and storm damage? Yes [ ] No [ ]
Don't know [ ]

Are you:

Employed full-time	[ ]
Employed part-time	[ ]
Self-employed	[ ]
Unemployed	[ ]
Retired	[ ]
In education	[ ]
Homemaker	[ ]

Other (please describe).....

IF you are happy to answer this question, how would you describe your religious or spiritual beliefs of affiliation? .....

IF you are happy to answer this question, how would you describe your ethnic identity? .....

Thank you very much for taking the time to complete this questionnaire.

If you have any further queries about this survey please contact:

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Email: j.wilmshurst@shef.ac.uk

Thank you!

Appendix II: Final Questionnaire (UK Version)

Region:

The University Of Sheffield.

Extreme Weather Events and Natural Disasters:

Tell Us What You Think

This survey is part of an international study of people's attitudes to extreme weather events (e.g. hurricanes, floods, cyclones) in different parts of the world. We are interested in finding out your thoughts about how best to prepare for such events, and how you feel about the uncertainty and risk associated with when and how they may occur. Please answer all the questions, even if you're sometimes unsure. There are no right or wrong answers. It's your own personal experience and opinions we're interested in.

Firstly, we're interested in how any of these kinds of extreme weather events may have affected you, other members of your family, friends or neighbours.

Have you personally been affected by *(tick any that apply)*:

- ☐ **Flooding?**
- ☐ **Hurricanes/wind storms?**
- ☐ **Drought?**
- ☐ **Heatwave?**
- ☐ **Other (please specify)?**

When were you affected? (please state Month and Year for each event)?

How were you affected? ***(tick any that apply)***

Personal injury
Personal danger
Damage to your property (e.g. home, car, garden, pets, livestock, crops)
Evacuation from your property
Damage to your workplace
Disruption to your work, business, education.
Disruption to your transport, travel
Loss of services (electricity, water)
Other (please describe briefly):

Were any other members of your family affected?

Yes [ ] **No [ ]**

If so, how? ***(tick any that apply)***

Personal injury
Personal danger
Damage to their property (e.g. home, car, garden, pets, livestock, crops)
Evacuation from their property
Damage to their workplace
Disruption to their work, business, education.
Disruption to transport, travel
Loss of services (electricity, water)
Other (please describe briefly):

Please tell us more about any of your answers above, if you wish.

1. Tell Us What You Think About the Risks of Extreme Weather Events

1.1 Please indicate to what extent you agree with each of the following statements:

1.1.1 I think that extreme weather events are becoming more severe.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

1.1.2 I think that extreme weather events have become more frequent over the last 10 years.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

1.1.3 I think that extreme weather events will become more frequent over the next 10 years.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

1.1.4 I think that extreme weather events are becoming more difficult to predict.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

1.1.5 There's nothing anyone can do to stop extreme weather events happening.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

1.1.6 There's plenty that can be done to prevent the worst effects of extreme weather events on people.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

1.1.7 When natural disasters happen, the people who suffer most are usually the poor.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

1.1.8 When natural disasters happen, the people who suffer most are usually those who've done least to protect themselves.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

1.1.9 I feel at personal risk from extreme weather events.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

1.1.10 I feel frightened at the thought of extreme weather events.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

1.1.11 I prefer not to think about extreme weather events.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

1.1.12 I think that extreme weather events should as far as possible be prevented from happening in the first place.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

1.2 Please indicate to what extent you agree with each if the following statements:

1.2.1 I *am responsible for* protecting myself/my family from extreme weather events.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

1.2.2 I *am able to* protect myself/my family from extreme weather events.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

1.2.3 I *am responsible for* protecting my property from extreme weather events.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

1.2.4 I *am able to* protect my property from extreme weather events.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

1.2.5 I *am responsible for* helping my neighbours to protect themselves from extreme weather events.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

1.2.6 I *am able to* help my neighbours to protect themselves from extreme weather events.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

1.2.7 I *am responsible for* helping my neighbours to protect their property from extreme weather events.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

1.2.8 I *am able to* help my neighbours to protect their property from extreme weather events.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

1.3 Please indicate to what extent you agree with each of the following statements:

1.3.1 There is no point in me doing things to protect my local environment from extreme weather events if my neighbours aren't doing the same.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

1.3.2 I shouldn't have to take action against extreme weather events if others aren't doing the same.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

1.3.3 I don't see the point in taking action unless I know exactly what the risks are.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

1.3.4 I do more than others in my neighbourhood to protect my local environment from extreme weather events.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

1.3.5 The best way that we can help ourselves is by helping each other

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

1.4 Compared to other parts of the world, do you feel that this country is more or less at risk from extreme weather events?

Much more	A little more	About the same	A little less	A lot less
☐	☐	☐	☐	☐

1.5 Compared to other parts of this country, do you feel that this part is more or less at risk from extreme weather events?

Much more	A little more	About the same	A little less	A lot less
☐	☐	☐	☐	☐

1.6 Compared to other homes in your neighbourhood, do you feel that your home is more or less at risk from extreme weather events?

Much more	A little more	About the same	A little less	A lot less
☐	☐	☐	☐	☐

1.7 How much do you *trust* each of the following to give you accurate information about risks of extreme weather events?

	Not at all	A little	A moderate amount	Very much
The national government	☐	☐	☐	☐
The local government	☐	☐	☐	☐
Scientists	☐	☐	☐	☐
Local community figures	☐	☐	☐	☐
The media	☐	☐	☐	☐
Friends and family	☐	☐	☐	☐

1.8 How much do the following *know* about risks of extreme weather events?

	Not at all	A little	A moderate amount	Very much
The national government	☐	☐	☐	☐
The local government	☐	☐	☐	☐
Scientists	☐	☐	☐	☐
Local community figures	☐	☐	☐	☐
The media	☐	☐	☐	☐
Friends and family	☐	☐	☐	☐

1.9 How much do the following *have your interests at heart* when it comes to risks of extreme weather events?

	Not at all	A little	A moderate amount	Very much
The national government	☐	☐	☐	☐
The local government	☐	☐	☐	☐
Scientists	☐	☐	☐	☐
Local community figures	☐	☐	☐	☐
The media	☐	☐	☐	☐
Friends and family	☐	☐	☐	☐

1.10 How much do you think that the following *have the capacity to manage* the risks of extreme weather events?

	Not at all	A little	A moderate amount	Very much
The national government	☐	☐	☐	☐
The local government	☐	☐	☐	☐
Scientists	☐	☐	☐	☐
Local community figures	☐	☐	☐	☐
The media	☐	☐	☐	☐
Friends and family	☐	☐	☐	☐

2. Tell Us About Your Community

2.1 How long have you lived here?

.....**years**

2.2 Do you live here all year round?

Yes ☐ **No** ☐

2.3 How attached do you feel to the community here?

Not at all	A little	Moderately	Very much
☐	☐	☐	☐

2.4 Approximately how many members of the community do you regard as personal friends? (Please give a number)

.....**members**

2.5 How much do you feel that you identify with this community?

Not at all	A little	Moderately	Very much
☐	☐	☐	☐

2.6 Please indicate to what extent you agree which each of the following statements:

2.6.1 I don't care too much where I live as long as my family and I are safe.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

2.6.2 I don't care too much where I live as long as my property is safe from damage.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

2.6.3 Extreme weather events are just something we have to learn to put up with if we want to live here.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

2.6.4 Losing material possessions as a result of extreme weather doesn't bother me too much.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

2.6.5 Having to move away from this neighbourhood due to extreme weather events would really bother me.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

2.6.6 I would prefer to live here even if my property became more at risk from extreme weather events.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

2.6.7 It would take a lot more than bad weather to make me want to move away from here.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

2.6.8 I would rather accept the risks than move away from this house.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

2.6.9 I would rather accept the risks than move away from the people I know.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

2.6.10 I think that dealing with the **after effects** of extreme weather events brings the community closer together.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

2.6.11 I think that dealing with the **risks and uncertainty** of extreme weather events brings the community closer together.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

2.7 Please rate the following items in order of the distress they would cause you in relation to an extreme weather event hitting your area. Please use **1** as **most** distressing and **10** as **least**.

Item	Priority
Loss of income	
Disruption to transport	
Personal injury	
Having to move house within the neighbourhood	
Disruption to services (electricity/water)	
Loss of personal possessions	
Injury to family members	
Having to move to a new neighbourhood	
Having to live in temporary accommodation	
Injury to friends	

3. Tell Us About Your Actions Regarding Extreme Weather Events

3.1 Below are some of the things that people do to guard against extreme weather events. Please indicate which of them you do yourself: ***(tick any that apply)***

Organize community meetings to exchange ideas and plan for extreme weather events ☐

Attend community meetings to exchange ideas and plan for extreme weather events ☐

Follow recommendations from the national or local government ☐

Construct defences in your own home ☐

Campaign for action by the national or local government ☐

3.2 How *important* do you think each of the above activities is?

3.2.1 Organize community meetings to exchange ideas and plan for extreme weather events.

Not at all important	A little	Moderately	Extremely important
☐	☐	☐	☐

3.2.2 Attend community meetings to exchange ideas and plan for extreme weather events.

Not at all important	A little	Moderately	Extremely important
☐	☐	☐	☐

3.2.3 Follow recommendations from the national or local government.

Not at all important	A little	Moderately	Extremely important
☐	☐	☐	☐

3.2.4 Construct defences in your own home.

Not at all important	A little	Moderately	Extremely important
☐	☐	☐	☐

3.2.5 Campaign for action by the national or local government.

Not at all important	A little	Moderately	Extremely important
☐	☐	☐	☐

3.3 Do you do anything else in preparation for extreme weather events?

Yes ☐ **No** ☐

If so, please briefly describe what you do in the box provided below.

3.4 *After* an extreme weather event, whom would you turn to first for help?

Local council	☐
Friends	☐
Insurance company	☐
Family	☐
People with influence in your community	☐
Police	☐
Your member of parliament	☐
Other (please specify)	☐

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4. Tell Us What You Think About Climate Change

4.1 Do you personally feel that the world's climate is changing as a result of human activity or not?

Yes	☐
No	☐
Not sure	☐

4.2 To what extent do you believe that climate change contributed to each of the following events?

4.2.1 The Asian Tsunami in December 2004?

Not at all	A little	Moderately	Extremely	Don't know
☐	☐	☐	☐	☐

4.2.2 Hurricane Katrina in August 2005?

Not at all	A little	Moderately	Extremely	Don't know
☐	☐	☐	☐	☐

4.2.3 Floods in Central/Northern England in July/August 2007?

Not at all	A little	Moderately	Extremely	Don't know
☐	☐	☐	☐	☐

4.2.4 Fires in California in October 2007?

Not at all	A little	Moderately	Extremely	Don't know
☐	☐	☐	☐	☐

4.2.5 Floods in Mexico in October/November 2007?

Not at all	A little	Moderately	Extremely	Don't know
☐	☐	☐	☐	☐

4.2.6 Cyclone in Bangladesh in November 2007?

Not at all	A little	Moderately	Extremely	Don't know
☐	☐	☐	☐	☐

4.2.7 Tornadoes in Tennessee in January 2008?

Not at all	A little	Moderately	Extremely	Don't know
☐	☐	☐	☐	☐

4.3 Please indicate to what extent you agree with each of the following statements:

4.3.1 I believe that the risks of climate change have been greatly exaggerated.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

4.3.2 Scientists now agree that climate change is really happening.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

4.3.3 There's nothing anyone can do to stop climate change happening.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

4.3.4 There's plenty that can be done to prevent the worst effects of climate change on people.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

4.3.5 There's no point in doing anything about climate change until we know all the facts for certain.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

4.3.6 There's plenty that can be done to prevent the worst effects of climate change on other species.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

4.3.7 There's plenty that can be done to prevent the worst effects of climate change on the natural environment.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

4.3.8 I would prefer not to change my lifestyle if other methods can be found to deal with climate change.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

4.3.9 It's the job of leaders, not ordinary people like us to do something about climate change.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

4.3.10 Other things being equal, which do you think is going to be more important in dealing with climate change: New technology, or changes in individual lifestyle? Please tick one of the boxes below:

New technology much more than lifestyle change	[ ]
New technology a bit more than lifestyle change	[ ]
Both about the same	[ ]
Lifestyle change a bit more than new technology	[ ]
Lifestyle change much more than new technology	[ ]

4.3.11 Other things being equal, where do you think the main responsibility lies for dealing with climate change?
Please imagine that you have 100 points to share out between the following five categories of people. Give more points to a category that you think has more responsibility. You can distribute the points however you wish *as long as they all add up to 100.* For example, if you thought that, say, political leaders had *all* the responsibility, you could give them 100, and everyone else 0.

Political Leaders	[ ]
Ordinary citizens	[ ]
Business and Industry	[ ]
Religious/spiritual leaders	[ ]
Scientists	[ ]
The UN	[ ]

4.3.12 I believe that the natural world is a resource for the use of human beings.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

4.3.13 I believe that human beings are at the mercy of the natural world.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

4.3.14 I believe that human beings are more important than other species.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

4.3.15 I believe that human beings and the natural world are dependent on each other.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

4.3.16 I believe that human beings should to be able to control the natural world.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

4.3.17 I believe that human beings are absolutely part of natural world.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

4.3.18 I believe that the natural world is more powerful than human beings.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

5. Tell Us About How You Make Decisions

5.1 People differ in how comfortable they feel about making decisions. Please indicate how you feel about making decisions by ticking the response which is most applicable to you.

		True for me	Sometimes true	Not true for me
(1)	**I feel confident about my ability to make decisions**	[ ]	[ ]	[ ]
(2)	**I feel inferior to most people in making decisions**	[ ]	[ ]	[ ]
(3)	**I think that I am a good decision maker**	[ ]	[ ]	[ ]
(4)	**I feel so discouraged that I give up trying to make decisions**	[ ]	[ ]	[ ]
(5)	**The decisions I make turn out well**	[ ]	[ ]	[ ]
(6)	**It is easy for other people to convince me that their decision rather than mine is the correct one**	[ ]	[ ]	[ ]

5.2 People differ in the way they go about making decisions. Please indicate how you make decisions by ticking for each question the response which best fits your usual style.

When making decisions -	True for me	Sometimes true	Not true for me
1. I feel as if I'm under tremendous time pressure when making decisions	[ ]	[ ]	[ ]
2. I like to consider all of the alternatives	[ ]	[ ]	[ ]
3. I prefer to leave decisions to others	[ ]	[ ]	[ ]
4. I try to find out the disadvantages of all alternatives	[ ]	[ ]	[ ]
5. I waste a lot of time on trivial matters before getting to the final decision	[ ]	[ ]	[ ]
6. I consider how best to carry out the decision	[ ]	[ ]	[ ]
7. Even after I have made a decision I delay acting upon it	[ ]	[ ]	[ ]
8. When making decisions I like to collect lots of information	[ ]	[ ]	[ ]
9. I avoid making decisions	[ ]	[ ]	[ ]
10. When I have to make a decision I wait a long time before starting to think about it	[ ]	[ ]	[ ]

11.	I do not like to take responsibility for making decisions	[ ]	[ ]	[ ]
12.	I try to be clear about my objectives before choosing	[ ]	[ ]	[ ]
13.	The possibility that small things might go wrong causes me to swing abruptly in my preferences	[ ]	[ ]	[ ]
14.	If a decision can be made by me or another person I let the other person make it	[ ]	[ ]	[ ]

When making decisions -		True for me	Sometimes true	Not true for me
15.	Whenever I face a difficult decision I feel pessimistic about finding a good solution	[ ]	[ ]	[ ]
16.	I take a lot of care before choosing	[ ]	[ ]	[ ]
17.	I do not make decisions unless I really have to	[ ]	[ ]	[ ]
18.	I delay making decisions until it is too late	[ ]	[ ]	[ ]
19.	I prefer that people who are better informed decide for me	[ ]	[ ]	[ ]

20.	**After a decision is made I spend a lot of time convincing myself it was correct**	[ ]	[ ]	[ ]
21.	**I put off making decisions**	[ ]	[ ]	[ ]
22.	**I cannot think straight if I have to make decisions in a hurry**	[ ]	[ ]	[ ]

Finally, please tell us something about yourself.

Are you Male [ ] Female [ ] ?

How old are you? ..... years.

Do you own your own home? Yes [ ] No [ ]

Is your home insured against floods and storm damage? Yes [ ] No [ ] Don't know [ ]

Do you have any children? Yes [ ] No [ ]

If so, how old are they?.....

Are you (Please tick only one):

Employed full-time [ ]
Employed part-time [ ]
Self-employed [ ]
Unemployed [ ]
Retired [ ]
In education [ ]
Homemaker [ ]
Other (please describe).....

If you are willing to answer, please choose the term below which you feel most accurately describes your religious or spiritual beliefs or affiliation?

Christian	☐	**Muslim**	☐
Hindu	☐	**Sikh**	☐
Buddhist	☐	**Jewish**	☐
Agnostic	☐	**Atheist**	☐
Other (Please describe)	☐		

If you are willing to answer, please choose the term below which you feel most accurately describes your ethnic origin.

White – British	☐	**Asian or Asian British – Bangladeshi**	☐
White – Irish	☐	**Asian or Asian British – Chinese**	☐
White – other background	☐	**Asian – other background**	☐
Black or Black British - Caribbean	☐	**Mixed – White and Black Caribbean**	☐
Black or Black British – African	☐	**Mixed – White and Black African**	☐
Black – other background	☐	**Mixed – White and Asian**	☐
Asian or Asian British – Indian	☐	**Mixed – Other background**	☐
Asian or Asian British - Pakistani	☐	**Other ethnic background**	☐

Thank you very much for taking the time to complete this questionnaire.

If you have any further queries about this survey please contact:

Jacqui Wilmshurst	Tel: +44 114 2226581
Department of Psychology	Email: j.wilmshurst@shef.ac.uk
University of Sheffield	
Western Bank	
Sheffield	
S10 2TP,	
United Kingdom.	**Thank you!**

Appendix III: Ethics Approval Application

RESEARCH ETHICS APPROVAL FORM

STAFF/POSTGRADUATE RESEARCH

All staff (including research staff) and postgraduate students conducting research in the Department of Psychology must complete this form before commencing their research. Empirical work must not begin until the Department Ethics Sub-Committee has approved the research.

Postgraduate Name	**Jacqui Wilmshurst**
Research Staff Name	
Staff Name	**Dick Eiser**
Date Ethics Form submitted	**30 October 2007**
Proposed starting date of research	**November 2007**

Brief title of investigation (state if this application is for a single study or for a series of studies using the same methodology):

Living with the Risk of Extreme Weather Events: An Internationally Comparative Study of Community Attitudes, Perceptions and Behaviours

This study is a series of studies in different locations around the world, using the same methodology

Aims/value of research:

To understand better the psychological factors underlying behaviour in relation to the risk of extreme weather events. The research will proved insight into the perceptions of risk, the motivations to engage in protective behaviour and the barriers to effective mitigation and preparation strategies. This will in turn serve to inform policy makers and risk communicators about the range of factors influencing people's behaviour in this context and help them to make more effective decisions.

Proposed participants in research (Explain fully who the participants will be and how they will be recruited. If the study does not involves a Level 1

Psychology student sample, the information sheet provided to participants must be attached to this form. If the study involves animals, state none and go to final section on research involving animals). If the study does not involve human or animals, e.g., computer modelling, state none and go to signature(s):

The samples are community based and are selected because they live in areas at risk from extreme weather events (flooding, hurricanes, tornadoes, drought, heat-wave, ice-storm). In the UK, participants will be approached via house calls, whilst in the USA and Belize communities will be approached through a key individual (eg. village chair person) as appropriate, who will be able to advertise the project and assist in recruiting individuals. All surveys will be distributed via face-to-face contact with participants

Brief description of methods and procedure (give reference to established method where appropriate):

A questionnaire survey administered face-to-face by the researcher. The questionnaire consists of statements with responses in the form of Likert scales, plus requests for additional descriptive information where appropriate. Demographic information is requested but no information is requested that would personally identify the participants.

Has it been established that the proposed methodology will produce data from which meaningful conclusions can be drawn?

Yes

How will participants give informed consent to participate in the study? (Give details, including details of procedures involving parental or guardian consent):

As the survey is administered face-to-face, a full description of the purpose and nature of the study will be given verbally and consent will be obtained verbally through agreement to complete a questionnaire. It will be made clear that participation is entirely voluntary and that participants may withdraw at any stage.

Does the study involve any of the following ethical issues?(circle all that apply)

Questionnaires touching on sensitive issues	*Yes / NoX*
Deception	*Yes / NoX*
A procedure that might cause distress - even inadvertently	*Yes / NoX*
Designs involving stressful situations	*Yes / NoX*

Possible breach of confidentiality	*Yes / NoX*
Invasion of privacy	*Yes / NoX*
Working with children	*Yes / NoX*
Working with disabled people	*Yes / NoX*

What procedures will be used to address these issues (e.g. debriefing, providing information/help, ensuring confidentiality is preserved). The committee may ask to see copies of relevant documents.

N/A

Signature(s)

I have read the BPS ethical guidelines for research and I am satisfied that all ethical issues have been identified and that satisfactory procedures are in place to deal with those issues in this research. I will abide by University Health and Safety Regulations (http://www.shef.ac.uk/safety/cop/part1/index.html) including the codes of practice designed to ensure the safety of researchers working away from University premises.

Student: **Jacqui Wilmshurst** **Date:** **30th October 2007**

Staff:  **Date:** **30th October2007**

Forward the completed form to Paschal Sheeran, Chair of DESC or Linda Belk, Postgraduate Secretary

Appendix IV: Ethics Approval Letter

The University Of Sheffield.

Department Of Psychology.

Jacqui Wilmhurst
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27 September 2010

Re: Ethics of "Living with the Risk of Extreme Weather Events: An Internationally Comparative Study of Community Attitudes, Perceptions and Behaviours"

Dear Jacqui,

This letter is to confirm that the ethics of the above project were approved by the Department Ethics Sub-Committee on November 5, 2007.

Yours sincerely,

Paschal Sheeran

Paschal Sheeran, PhD
Chair, Department Ethics Sub-Committee